SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Preliminary Draft Staff Report

Proposed Amended Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters

Proposed Amended Rule 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters;

Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters; and

Proposed Rule 1100 - Implementation Schedule for NOx Facilities

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EXECUTIVE SUMMARY

Control Measure CMB-05 of the Final 2016 Air Quality Management Plan (AQMP) directed staff to achieve a five tons per day NOx emission reduction as soon as feasible but no later than 2025, and to transition the Regional Clean Air Incentives Market (RECLAIM) program to a command-and-control regulatory structure requiring Best Available Retrofit Control Technology (BARCT) as soon as practicable. California State Assembly Bill 617, approved by the Governor on July 26, 2017, requires Air Districts to develop, by January 1, 2019, an expedited schedule for the implementation of BARCT no later than December 31, 2023 for facilities that are in the state greenhouse gas cap and trade program.

RECLAIM under Regulation XX, adopted in October 1993, is a market-based emissions trading program aimed to reduce NOx and SOx emissions in the South Coast Air Basin. Proposed Amended Rules 1146, 1146.1 and 1146.2 update NOx emission limits for boilers, heaters, and steam generators applicable to these rules. The revised NOx emission limits represent BARCT and apply to RECLAIM and non-RECLAIM facilities. Proposed Rule 1100 – Implementation Schedule for NOx Facilities (PR 1100) establishes the compliance schedule for facilities exiting the RECLAIM program. The compliance deadlines for Proposed Amended Rules 1146 and 1146.1 were established taking into consideration equipment size range, fuel type, the number of units at a facility, and facilities with multiple units subject to multiple source-specific command-and-control rules. PR 1100 allows facilities with Rule 1146/1146.1 units until January 1, 2022 to retrofit all existing units and until January 1, 2023 to replace any existing units. In the proposed amendments to Rule 1146.2, units between 400,000 British thermal units per hour to 2 million British thermal units per hour (MMBtu/hr) would have to comply with the 30 ppm limit by December 31, 2023, if a technology assessment (to be completed by January 1, 2022) determines that the NOx emission limits specified in Rule 1146.2 still represent BARCT.

Among the 103 RECLAIM facilities that will be affected by the proposed amendments, 66 facilities would be required to retrofit the non-compliant units by the compliance dates specified in PR 1100, while 10 facilities operating units that comply with the applicable RECLAIM BARCT limit of 12 ppm would not need to demonstrate compliance with the compliance dates specified in Rule 1100 until the unit's burner replacement or 15 years after rule adoption, whichever occurs earlier. The permitted Rule 1146/1146.1/1146.2 units in the remaining 27 facilities meet BARCT, but could be impacted by the changes in Monitoring, Reporting and Recordkeeping requirements as they transition from the RECLAIM program into a command-and-control regulatory structure. The cost effectiveness for PARs 1146 series ranged from $13,300 to $48,000 per ton of NOx reduced varying depending on the equipment size, type of retrofits, and the unit's operation and load. The proposed rule amendments are estimated to reduce 0.27 tons per day of NOx from RECLAIM equipment by January 1, 2023. For non-RECLAIM facilities, with the exception of thermal fluid heaters, the units would be required to demonstrate compliance upon burner replacement, where the cost effectiveness is below $15,000 per ton of NOx reduced. For thermal fluid heaters, the cost effectiveness is assumed to be the same as that for RECLAIM facilities, which is approximately $39,000 per ton of NOx reduced.

CHAPTER 1: BACKGROUND

INTRODUCTION

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INTRODUCTION

The Regulation XX - Regional Clean Air Incentives Market (RECLAIM) was adopted in October 1993. The purpose of RECLAIM is to reduce NOx and SOx emissions through a market-based approach. The program replaced a series of existing and future command-and-control rules and was designed to provide facilities with the flexibility to seek the most cost-effective solution to reduce their emissions. It also was designed to provide equivalent emission reductions, in the aggregate, for the facilities in the program compared to what would occur under a command-and-control approach. Regulation XX includes a series of rules that specify the applicability and procedures for determining NOx and SOx facility emissions allocations, program requirements, as well as monitoring, reporting, and recordkeeping requirements for sources located at RECLAIM facilities.

Regulation XX – RECLAIM has been amended several times to reflect BARCT on a programmatic basis and was most recently amended on December 4, 2015 to achieve BARCT equivalent programmatic NOx emission reductions through an overall reduction in RECLAIM trading credit (RTC) of 12 tons per day from compliance years 2016 through 2022. RECLAIM was amended on October 7, 2016 to address RTCs from facility shutdowns. The most recent amendments to RECLAIM on January 5, 2018 was to amend Rules 2001 and 2002 to commence the initial steps to transition RECLAIM facilities to a command-and-control regulatory approach.

Control Measure CMB-05 of the Final 2016 Air Quality Management Plan (AQMP) directed staff to achieve a five tons per day NOx emission reduction as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT as soon as practicable. Consistent with the adoption resolution for the 2016 AQMP, staff is providing quarterly updates to the Stationary Source Committee on the status of the transition of RECLAIM facilities to command-and-control with quarterly reports provided on October 20, 2017, February 16, 2018, and June 15, 2018.

On July 26, 2017 California State Assembly Bill (AB) 617 was approved by the Governor, which addresses non-vehicular air pollution (criteria pollutants and toxic air contaminants). It is a companion legislation to AB 398, which was also approved, and extends California's cap-and-trade program for reducing greenhouse gas emissions from stationary sources. RECLAIM facilities that are in the cap-and-trade program are subject to the requirements of AB 617. Among the requirements of this bill is an expedited schedule for implementing BARCT for cap-and-trade facilities. Air Districts are to develop by January 1, 2019 an expedited schedule for the implementation of BARCT no later than December 31, 2023 with emphasis on the largest emission sources first.

In 2015, staff conducted a programmatic analysis of equipment at each RECLAIM facility to determine if there are appropriate and up to date BARCT NOx limits within existing command-and-control rules. It was determined that existing command-and-control rules would need to be adopted and/or amended to provide implementation timeframes for achieving BARCT compliance limits for certain RECLAIM equipment and to update emission limits to reflect current BARCT in some existing rules.

Proposed Amended Rules 1146, 1146.1 and 1146.2 update NOx emission limits for boilers, heaters, and steam generators applicable to these rules. The revised NOx emission limits represent BARCT and apply to RECLAIM and non-RECLAIM facilities. Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters applies to existing boilers, steam generators, and process heaters with maximum rated heat

input capacities greater than or equal to 5 million British thermal units per hour (MMBtu/hr). Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters applies to boilers, steam generators, and process heaters with maximum rated heat input capacities greater than 2 MMBtu/hr and less than 5 MMBtu/hr. Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters establishes NOx emission limits for large water heaters, boilers and process heaters less than or equal to 2 MMBtu/hr. Table 1 summarizes the applicability and existing NOx emission limits in Rules 1146, 1146.1 and 1146.2.

Proposed Rule 1100 - Implementation Schedule for NOx Facilities (PR 1100) establishes the compliance schedule for facilities exiting the RECLAIM program. The compliance timeframe for PARs 1146 and 1146.1 was established taking into consideration equipment size range and the number of units at a facility. Also taken into consideration within the compliance schedule are facilities with multiple units subject to multiple source-specific landing rules. PR 1100 allows facilities with Rule 1146 and/or Rule 1146.1 units until January 1, 2022 to retrofit all existing units and until January 1, 2023 to replace any existing units.

Table 1
Applicability and Existing NOx Emission Limits of Rules 1146, 1146.1, and 1146.2

Rule	Applicability	Size	Summary of NOx Emission Limits
Rule 1146	Boilers, steam generators, and process heaters	≥ 5 MMBtu/hr	• 5 ppm for units burning natural gas ≥ 75 MMBtu/hr; • 9 ppm for units burning gaseous fuels 5 to 75 MMBtu/hr • 30 ppm for thermal fluid heaters burning gaseous fuels • 15 ppm for units burning digester gas • 25 ppm for units burning landfill gas
Rule 1146.1	Boilers, steam generators, and process heaters	>2 and <5 MMBtu/hr	• 9-12 ppm for units burning natural gas • 30 ppm for thermal fluid heaters burning gaseous fuels • 15 ppm for units burning digester gas • 25 ppm for units burning landfill gas
Rule 1146.2	Natural gas-fired water heaters, boilers, and process heaters	≤ 2 MMBtu/hr	• Manufacturer limit of 20 ppm; • End-user limit of 30 ppm

REGULATORY HISTORY

The following provides an overview of the regulatory history for Rules 1146, 1146.1, and 1146.2. All three rules currently exempt RECLAIM facilities.

Rules 1146 and 1146.1

Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters was adopted September 1988 and establishes NOx limits for boilers, steam generators, and process heaters greater than or equal to 5 MMBtu/hour.

Rule 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters was adopted October 1990 and establishes NOx limits for boilers, steam generators and process heaters greater than 2 MMBtu/hour and less than 5 MMBtu/hour. In September 2008, Rules 1146 and 1146.1 were amended to reduce the allowable NOx emission limits from boilers based on rated heat input capacity. Rule 1146 establishes three groups of units based on the size or type of fuel used. The three Rule 1146 groups are as follows:

- Group I units include any unit burning natural gas, excluding digester and landfill gases, with a rated heat input greater than or equal to 75 MMBtu/hr, excluding thermal fluid heaters.
- Group II units include any unit burning gaseous fuels, excluding digester and landfill gases, with a rated heat input less than 75 MMBtu/hr down to and including 20 MMBtu/hr, excluding thermal fluid heaters.
- Group III units include any unit burning gaseous fuels, excluding digester and landfill gases, and thermal fluid heaters[1] with a rated heat input less than 20 MMBtu/hr down to and including 5 MMBtu/hr, and all units operated at schools and universities greater than or equal to 5 MMBtu/hr.

Under the 2008 amendment Rule 1146 Group I units were required to meet a lower emission limit of 5 ppm. Rule 1146 Group II and III units and Rule 1146.1 units, which represented approximately 1,600 units, were required to comply with the 9 ppm (0.011 lbs/10^6 Btu) NOx limit by January 1, 2012 through January 1, 2015. Amendments of Rule 1146 and 1146.1 also required equipment fired by landfill or digester gas to meet emissions limits of 25 ppm and 15 ppm, respectively, by January 1, 2015. The applicable compliance date depended on the unit's rated heat capacity, the number of units at the facility, and the type of service (e.g., supplying steam at a university). Both Rules 1146 and 1146.1 were amended in November 2013 to address a SIP approvability issue related to rule enforceability raised by EPA.

Rule 1146.2

Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers was adopted on January 9, 1998. Rule 1146.2 establishes NOx emission limits for large water heaters and small boilers with a rating of less than 2 MMBtu/hr. SCAQMD has developed a certification program (Rule 1146.2 Certification Program) through which manufacturers submit documentation for new units, including source test reports, to SCAQMD to demonstrate compliance with Rule 1146.2 emission limits. Rule 1146.2 does not regulate residential gas-fired tank type water heaters less than 75,000 Btu/hr heat input which are regulated under SCAQMD Rule 1121. Units used in

[1] A Thermal fluid heater means a process heater in which a process is heated indirectly by a heated fluid other than water.

recreational vehicles, and mobile homes are also exempt from the requirements of Rule 1146.2. The 1998 adoption of Rule 1146.2 established NOx emission limits for large water heaters and small boilers ranging from 75,000 Btu/hr up to and including 2 MMBtu/hr. New water heaters or boilers greater than 0.4 MMBtu/hr and less than or equal to 2 MMBtu/hr (Type 2) were required to meet an emission limit of 30 ppm of NOx and 400 ppm of CO. New units from 75,000 Btu/hr to 0.4 MMBtu/hr (Type 1) were required to meet a NOx emission limit of 55 ppm or 40 ng/Joule of heat output. Compliance dates for emission limitations were based on the date of equipment manufacture.

Rule 1146.2 was amended by the SCAQMD Governing Board at the January 7, 2005 hearing. Under the amended rule, compliance for existing in-use equipment was implemented as the unit reached 15 years of life. Lower emissions limits for new equipment were not considered for the January 7, 2005 rule amendment because additional time was needed to evaluate low NOx technologies and their cost-effectiveness.

Rule 1146.2 was amended again in May 2006 to address NOx emission limits for new equipment. With the exception for small pool heaters rated less than or equal to 400,000 Btu/hour, new manufactured units greater than 400,000 Btu/hr must meet a NOx emission limit of 20 ppm starting January 1, 2010. Most new manufactured units less than or equal to 400,000 Btu/hr must meet a 20 ppm (less than 14 ng/Joule heat output) NOx limit by January 1, 2012. Pool heaters rated less than or equal to 400,000 Btu/hr, will continue to meet the existing limit of 55 ppm (or 40 ng/Joule heat output). The cost effectiveness for meeting a 20 ppm NOx limit averaged $2,400 per ton for Type 2 units and up to $16,000 per ton for Type 1 units less than or equal to 400,000 Btu/hr.

AFFECTED INDUSTRIES

PARs 1146, 1146.1, and 1146.2 affect facilities in the NOx RECLAIM program as well as facilities outside of the RECLAIM universe with boilers, heaters, and process heaters that are greater than 75,000 Btu/hour. PARs 1146 and 1146.1 will require facilities to comply with lower emissions limits for applicable units located in the South Coast Air Basin and Coachella Valley. Rule 1146.2 do not have new requirements for non-RECLAIM facilities so these facilities are not impacted by the proposed amendments. In addition, PARs 1146, 1146.1, and 1146.2 exempt units that are subject to an industry-specific rule that includes a NOx emission limit for the applicable units in Rules 1146, 1146.1, and 1146.2. For example, boilers that are subject to an emission limit in Rule 1109.1 (Refinery Equipment) and Rule 1135 (Emissions of Oxides of Nitrogen from Electricity Generating Facilities) are regulated under the respective rules, and are exempt from PAR 1146 series. On the other hand, non-electricity generating boilers are not regulated in Rule 1135, and they will be subject to PAR 1146 series. As a result, energy generating boilers and refinery boilers that are in RECLAIM are not included in the analyses presented in this staff report.

Out of the 250 facilities currently in the NOx RECLAIM program as of August 2018, approximately 103 facilities would be affected by PARs 1146, 1146.1, and 1146.2 and PR 1100.

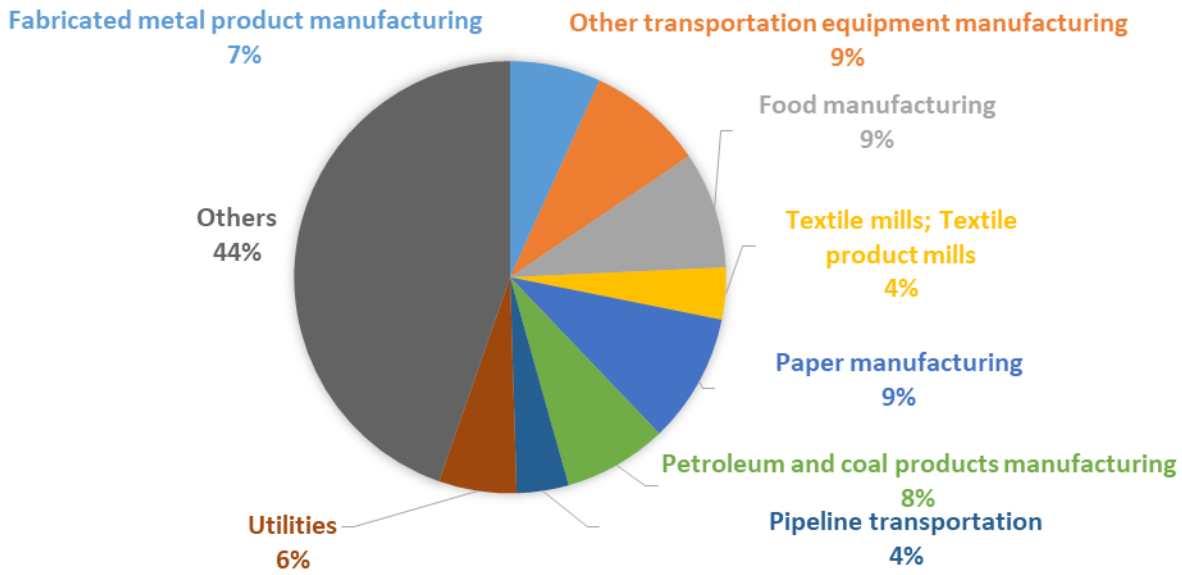


Figure 1
Industries Affected by PARs 1146 Series

When grouped according to the North American Industry Classification System (NAICS) (Figure 1), transportation equipment manufacturing, paper manufacturing, and food manufacturing are the largest contributors each accounting for 9% of the total, followed by petroleum and coal products manufacturing, fabricated metal product manufacturing, textile product mills, utilities, and pipeline transportation. Each single remaining group comprises less than 4% of the total. Remaining NAICS groups include, but are not limited to, chemical manufacturing, primary metal manufacturing, computer and electronic product manufacturing, and oil and gas extraction.

PUBLIC PROCESS

Development of PARs 1146, 1146.1, and 1146.2 and PR 1100 was conducted through a public process. SCAQMD staff has held six working group meetings at SCAQMD Headquarters in Diamond Bar on November 30, 2017, January 16, 2018, March 7, 2018, April 12, 2018, August 2, 2018, and August 29, 2018. The Working Group is composed of representatives from the manufacturers, trade organizations, permit stakeholders, businesses, environmental groups, public agencies, consultants, and other interested parties. The purpose of the working group meetings are to discuss proposed concepts and to work through the details of staff's proposal. A Public Workshop was held on February 14, 2018. A California Environmental Quality Act (CEQA) scoping meeting was held concurrently with the Public Workshop. Based on additional BARCT analysis another Public Workshop is scheduled to be held on September 20, 2018. Subsequent to the Public Workshop, written comments on PARs 1146, 1146.1, and 1146.2 and PR 1100 should be submitted by October 4, 2018.

In addition to the PARs 1146, 1146.1, and 1146.2 and PR 1100 Working Group Meetings, staff has also discussed concepts for the proposed rules at the RECLAIM Working Group meetings on July 13, 2017, September 14, 2017, October 12, 2017, January 11, 2018, February 8, 2018, March 8, 2018, April 12, 2018, May 9, 2018, June 14, 2018, July 12, 2018, and September 13, 2018. On April 20, 2018, the proposed amendments to Rule 1146 series and PR 1100 and the associated

impacts were presented to the Stationary Source Committee. Another presentation to Stationary Source Committee for PAR 1146 series and PR 1100 is scheduled on October 19, 2018.

Staff has also had numerous individual meetings with stakeholders who will be impacted by this rulemaking.

CHAPTER 2: CONTROL TECHNOLOGIES

BARCT ASSESSMENT FOR RULE 1146 AND 1146.1 EQUIPMENT

The California Clean Air Act (CCAA) requires districts to achieve and maintain state standards by the earliest practicable date, and for extreme non-attainment areas, to include all feasible measures. [Health and Safety (H&S) Code §§40913, 40914, and 40920.5]. The required use of *Best Available Retrofit Control Technology* (BARCT) for existing stationary sources is one of the specified feasible measures. Health & Safety Code §40406 defines BARCT as follows:

> *Best Available Retrofit Control Technology means an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.*

To assess the status of control technology for the source categories subject to the proposed amended rules and to ensure that the proposed amendments address BARCT requirements, staff has reviewed the commercially available NOx reduction technology for boilers, steam generators, and process heaters and evaluated NOx concentration limits established under rules and regulations at other air districts. A summary of the analysis of is provided below.

Assessment of SCAQMD Regulatory Requirements

As part of the BARCT assessment, staff reviewed SCAQMD Rules 1146 and 1146.1 which regulates emissions of oxides of nitrogen from industrial, institutional, and commercial boilers, steam generators and process heaters. Rule 1146 regulates units rated to greater than or equal to 5 MMBtu/hr and Rule 1146.1 regulates units rated to greater than equal to 2 MMBtu/hr and less than 5 MMBtu/hr. Current rule emission limits were adopted on September 5, 2008. All parts per million emission limits specified in rules are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes

Under Rule 1146 boilers, steam generators and process heaters fueled by gaseous fuels, excluding digester and landfill gases, are segregated into three different size groups: Group I (≥75 MMBtu/hr), Group II (≥20 and <75 MMBtu/hr) and Group III (≥5 and <20 MMBtu/hr). Group I units are limited to 5 ppm NOx, Group II and III are limited to 9 ppm NOx. Units that are fueled with non-gaseous fuels are subject to emission limit of 40 ppm.

Rule 1146.1 limit boilers and process heaters fueled by natural gas to 9 ppm NOx. Both Rules 1146 and 1146.1 includes a limit of 12 ppm NOx for atmospheric units[2] and a limit of 30 ppm for thermal fluid heaters. All units subject to Rule 1146 and 1146.1 fired by landfill gases are required to meet NOx emissions limits of 25 ppm by January 1, 2015, and units fueled by digester gas are required to meet 15 ppm by January 1, 2015.

[2] An atmospheric boiler is defined as a natural gas fired unit with a non-sealed combustion chamber in which natural draft is used to exhaust combustion gases.

Other Regulatory Requirements

Analysis of NOx Concentration Limits for Rules 1146 and 1146.1 Equipment at Other Air districts

To identify all the improvements in innovative control technologies, the SCAQMD compared the requirements in the PAR 1146 series with the analogous rules adopted by four other air districts in California. The four air districts were San Joaquin Valley, Sacramento Metropolitan, Ventura, and Bay Area. They are selected based on the severity of their nonattainment status for O_3 and PM2.5 federal air quality standards.

SJVAPCD Rule 4306, SJVAPCD Rule 4307, and SJVAPCD Rule 4320

SJVAPCD Rules 4306 Boilers, Steam Generators, and Process Heaters – Phase 3 and 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr apply to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 MMBtu/hr. SJVAPCD Rule 4307 Boilers, Steam Generators, and Process Heaters – 2.0 MMBtu/hr to 5.0 MMBtu/hr apply to any gaseous fuel or liquid fuel fired boiler, steam generators, and process heaters with a total heat input greater than or equal to 2.0 MMBtu/hr and less than or equal to 5.0 MMBtu/hr. SJVAPCD Rule 4307 limits natural gas fired non-atmospheric units to 9 ppm, natural gas fired atmospheric units to 12 ppm, and gaseous fuel-fired units to 30 ppm. SJVAPCD Rule 4320 Advanced Emissions Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr limits NOx emissions from units with greater than a 20 MMBtu/hr input rating to 7 ppm (or 5 ppm for compliance at a later date). For units with greater than a 5 MMBtu/hr input rating up to and including 20 MMBtu/hr, emission limit was set at 9 ppm (or 6 ppm for compliance at a later date). Units fueled by <50% California public utility commission (PUC) quality gas, such as landfill and digester, emission limit was set at 12 ppm (or 9 ppm for compliance at a later date). Depending on the equipment size and selected NOx limit, the proposed compliance date extended from January 1, 2011 to January 1, 2014.

Overall, SJVAPCD has a more stringent limit than SCAQMD rules for the subcategory between 20 and 75 MMBtu/hr (7 ppm in SJVAPCD Rule 4320 vs 9 ppm in SCAQMD Rule 1146). SJVAPCD is also more stringent for units fueled by digester/landfill gas (between 9 to 12 ppm in SJVAPCD Rule 4320 vs 15 ppm for digester gas fired units and 25 ppm for landfill gas fired units in SCAQMD Rule 1146 and Rule 1146.1) for units greater than 5 MMBtu/hr. It is important to note that for SJVAPCD's Rules 4306 and 4320, the owner or operator has the option of paying into an annual emissions fee in lieu of complying with the limits. Also, for units ≥ 75 MMBtu/hr, emission limit in SCAQMD Rule 1146 (5 ppm) is more stringent than SJVAPCD's limit of 7 ppm for natural gas units.

Sacramento Metropolitan Air Quality Management District (SMAQMD) Rule 411

SMAQMD Rule 411 NOx from Boilers, Process Heaters and Steam Generators establishes NOx emission limits boilers greater than or equal to 1 MMBtu/hr. The emission limits range from 15 to 30 ppm for units 1 to 20 MMBtu/hr, depending on equipment size and operation. For units greater than 20 MMBtu/hr, the limit is 9 ppm. Units that are fueled with landfill gas or combination of landfill gas and natural gas are limited to between 15 ppm as of October 27, 2009.

Ventura County Air Pollution Control District (VCAPCD) Rule 74.15 and Rule 74.15.1

VCAPCD Rule 74.15 Boilers, Steam Generators and Process Heaters (5 MMBtu/hr and greater) establishes a NOx emission limit of 40 ppm for boilers greater than or equal to 5 MMBtu/hr regardless of fuel type. For natural gas fired units greater than 2 and less than 5 MMBtu/hr,

emission limits range from 9 to 12 ppm in Rule 74.15.1 Boilers, Steam Generators and Process Heaters (1 to 5 MMBtu/hr). Rule 74.15.1 also requires units greater than 2 and less than 5 MMBtu/hr fueled by digester and landfill gases to meet emission limits of 15 ppm and 25 ppm respectively. The same rule requires units equal to or greater than 1 and less than or equal to 2 MMBtu/hr to limits their NOx emissions to 20 ppmv.

Bay Area Air Quality Management District (BAAQMD) Regulation 9 Rule 7

BAAQMD Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters) establishes NOx emission limits for boilers greater than 2 MMBtu/hr. The emission limits range from 15 to 30 ppm for units 2 MMBtu/hr to and including 20 MMBtu/hr, depending on equipment size and operation. For units greater than 20 MMBtu/hr and less than 75 MMBtu/hr, the limit is 9 ppm. The emission limit is 5 ppm for units greater than or equal to 75 MMBtu/hr. Units greater than 1 MMBtu/hr fueled by landfill or digester gas are required to meet emission limit of 30 ppm.

Assessment of Emission Limit for Existing Units

Permit Limits

As part of BARCT analysis, staff reviewed permit limits for existing boilers, steam generators, and process heaters fueled by natural gas, landfill gas and digester gas from within SCAQMD as well as permitting databases from other agencies. The objective of this task is to ascertain if any existing units currently permitted below current limits of Rule 1146 and 1146.1. The analysis also looked into identifying other control technologies implemented by permitted equipment in order to achieve designated permit limits. Additional considerations were made in regards to equipment configurations such as water-tube and fire-tube. Data from outside of SCAQMD was obtained from analyzing clearinghouse databases from the United States Environmental Protection Agency (US EPA), California Air Resources Board (CARB), and various local level agencies such as San Joaquin Valley APCD and Bay Area AQMD as well as installation lists provided by equipment vendors and local air agencies.

From the US EPA and California ARB clearinghouse database, several large units (>75 MMBtu/hr) fired with natural gas were found to be permitted at 5 ppm NOx with SCR post combustion controls and the requirements are in line with SCAQMD Rule 1146 Group I requirements. No examples of units fired with natural gas with a permit limit of 7 ppm or below utilizing ULNB retrofits were identified in the EPA or CARB clearinghouses. Similar results were found from clearinghouse databases of BAAQMD, SMAQMD and VCAPCD. From vendor provided installation lists and source test data, one new natural gas fired unit was identified in SJVAPCD with a permitted limit of 5 ppm with only ULNB. One new natural gas fired unit was identified within SCAQMD with permit limit of 7 ppm utilizing only ULNB as control technology.

Analysis of previously mentioned clearinghouse databases were also conducted for landfill gas fired and digester gas fired units. Landfill gas and digester gas are both forms of biogas created by decomposition of organic materials. Landfill gas is generated by chemical reactions between waste components and microbial action during waste decomposition occurring in landfill operations. Due to the nature of landfills, the supply of combustible gases are dependant on the amount of waste added and is expected to fall off after landfill closure as biological materials complete their decomposition process Digester gas is generated by anaerobic biological reactions that occur inside of anaerobic digesters, bioreactors or bioreactors. Digester gas is usually a byproduct of waste treatment or various forms of fermentation processes and the sources are not limited to a set lifespan like landfills. Rules 1146 and 1146.1 currently limits digester gas fired units to 15 ppm and landfill gas fired units to 25 ppm.

SJVAPCD and SMAQMD provided permitting data and source test results for the landfill gas fired and digester gas fired units in the respective jurisdiction. The lowest permitted digester gas fired unit, demonstrated by source test, is located in SJVAPCD with a permit limit of 5 ppm. The unit is rated at 99 MMBtu/hr equipped with SCR post combustion control technology and was permitted as new; however, it is important to note that the source of this unit's digester gas is not from a waste treatment facility and would not necessarily have the same challenges as those experienced in waste treatment facilities. One unit operating in a wastewater reclaimation facility located in SJVAPCD was able to demonstrate compliance to a permit limit of 9 ppm with only retrofitted ultra low NOx burner technology. Digester units located in SCAQMD are permitted to a limit of 15 ppm. The lowest permitted landfill gas fired unit, demonstrated by source test, is located in SMAQMD with a permit limit of 15 ppm. The unit is rated at 32.4 MMBtu/hr and utilized ULNB retrofit technology. The lowest limit for permitted landfill units located in SCAQMD is rated to 115 MMBtu/hr, permitted new, limited to 21 ppm.

Permit limits from thermal fluid heaters located within SCAQMD were also analyzed. Thermal fluid heaters are a form of process heaters that indirectly heat processes through the usage of thermal fluids that are not water. Thermal NOx emissions from thermal fluid heater differ from other water process heaters due to higher operating temperatures. The current emission limit for thermal fluid heaters under Rule 1146 and 1146.1 is 30 ppm. Permit limits for units in SCAQMD range between 9 ppm to 30 ppm. Most of the newly permitted units located in SCAQMD are given permit limits of 20 ppm based on manufacturer guarantees. One unit was found to be permitted new at 9 ppm with only ULNB technology and some units were permitted at 12 ppm retrofitted with only ULNB technology. From analysis of existing permitted limits, the unit with the lowest permitted emission limit was identified to be located in San Joaquin Valley APCD with a permitted limit of 5 ppm utilizing only ULNB technology. The unit was permitted as new equipment subject to BACT.

The main limitation involved with utilizing clearinghouse databases is the frequency in which they are updated. Clearinghouse data are usually not up-to-date and do not reflect most recent best available control technology. Information that are not available in clearinghouse data are provided by vendors in the form of installation lists.

Source Test

One of the main tools used for compliance demonstration is source tests conducted under District approved protocols. Rules 1146 and 1146.1 requires periodic source tests for facilities to demonstrate compliance with applicable rule and permit limits. For RECLAIM facilities permitted with concentration limits, periodic RECLAIM source tests must be conducted to demonstrate equipment operates under the permit limit.

Staff analyzed source test results submitted by facilities to determine the technical feasibility of establishing a lower BARCT limit. Within SCAQMD, there is a total of 1,072 non-RECLAIM[3] units subject to Rule 1146.1, 1,068 non-RECLAIM units subject to Rule 1146, and 259 units subject to RECLAIM rules. A total of 183 units was surveyed for real world emissions via facility submitted source test reports. Total units surveyed make up for 8.6% of total units located in SCAQMD with 92 units from the non-RECLAIM universe and 91 units from the RECLAIM universe. Source tests were obtained from SCAQMD database which consists of reports submitted by facilities to demonstrate compliance to various monitoring and testing requirements. SCAQMD requires equipment source tests to be conducted in an "as found" condition and emissions results

[3] Command and control equipment distribution figures obtained from 2008 rule revision staff report for Rule 1146 and 1146.1

are an average of the testing period. Some source test are conducted at different "loads" at a set time span. To account for source tests conducted at multiple load settings, the highest emission result was used for the analysis.

From the data set mentioned above, 35 units were subject to Rule 1146.1 NOx limits. Thirty four out of 35 were fueled with natural gas and subject to rule limits ranging from 9 to 12 ppm. Eight out of the 34 natural gas fueled units were atmospheric units subject to the rule limit of 12 ppm. Twenty one of the 35 units were source tested about 10% below the rule limits. The remaining fourteen units demonstrated levels substantially lower (> 30%) than 9 ppm (i.e., below 6.3 ppm). Among the fourteen units, 11 were new or modified units permitted at BACT, and 3 were retrofit units. The source test results show that it is technically feasible to retrofit a Rule 1146.1 unit to achieve an emission level of 7 ppm, providing at least 10% buffer for rule compliance. Four out of 8 atmospheric units were tested to show substantially lower (>30%) than 12 ppm (i.e. below 8.1 ppm) and all 4 were new or modified units permitted at BACT. The remaining four out of 8 atmospheric units were source tested about 10% below the rule limit of 12 ppm. Thus the source test records do not support the feasibility of retrofitting Rule 1146.1 atmospheric units to achieve an emission level of 9 ppm after providing a 10% buffer for possible rule compliance.

A total of 134 units were identified to be applicable for Rule 1146 NOx emission limits, with 2 atmospheric units (5 to 10 MMBtu/hr), 73 units in Group III (5 to 20 MMBtu/hr), 44 units in Group II (20 to 75 MMBtu/hr) and 15 units in Group I and II equipped with SCR. Units equipped with SCR are required to meet 5 ppm regardless of unit size, so analysis summary combined Group I and SCR equipped units together.

Results displayed in Table 2 show that it is technically feasible to retrofit Rule 1146 Group III and Group II units to achieve an emission limit of 7 ppm; and Rule 1146 units equipped with SCR to achieve an emission limit of 4 ppm, both providing a 10% buffer for possible compliance demonstration. Table 2 also shows that it is not technically feasible to retrofit Rule 1146 atmospheric units to achieve an emission level of 9 ppm.

Table 2
Source Test Evaluation for Rule 1146 Equipment

Category	Equipment Range	Current Rule Limit	Total Units Surveyed	Number of Units Tested to be > 30% below Existing Rule Limit	
				New	Retrofit
Rule 1146 Atmospheric (Group III)	5-10 MM BTU/HR	12 ppm	2	2	0
Rule 1146 Group III	5-20 MM BTU/HR	9 ppm	73	9	2
Rule 1146 Group II	20-75 MM BTU/HR	9 ppm	44	10	2
SCR Boilers (Groups I, II, & III)	21-127 MM BTU/HR	5 ppm	15	1	5

Source tests records from a total of 14 thermal fluid heaters ranging from 2 MMBtu/hr to 10 MMBtu/hr with emissions limit of 30 ppm were evaluated. Five out of 14 units source tested substantially (>64%) below the permit limit. Out of the five units, 3 units were new or modified equipment permitted at BACT and 2 units were retrofits. This shows that it is technically feasible

to retrofit Rule 1146.1 and 1146 thermal fluid heaters to achieve an emission level of 12 ppm after providing at least 10% buffer for rule compliance.

In addition to natural gas fired units, source test results of twenty-two digester gas fired units and three landfill gas fired units subject to Rule 1146 and 1146.1 were also evaluated. Digester gas fired units ranged between 3 to 63 MMBtu/hr while landfill gas fired units ranged from 115 to 335 MMBtu/hr. Out of twenty-two total digester gas fired units, five units source tested substantially (>40%) below permit limit of 15 ppm. Out of those five units, two units were boilers with burner retrofits and the other three units were permitted new. These results show that it is technically feasible to retrofit digester gas fired units to meet emission limits lower than 15 ppm. Out of the three source tests for landfill gas fired units, two units were source tested to show emissions below permitted limits (>20%) of 21 and 25 ppm. Surveyed units are also operating with the burners that were originally designed for the equipment. Original permit applications for the three landfill gas fired units were submitted between 1984 and 1990. Even though analyzed source test results were limited to equipment operating with burners designed back in original permit application, test results suggest that it is feasible for currently equipped burners to be able to meet a lower emission limit.

Continuous Emissions Monitoring System

Continuous emissions monitoring systems (CEMS) are continuous monitors affixed to the equipment's exhaust stack that offers constant real time averages (both 15 minute and hourly) for NOx or CO depending on the type of analyzer used. CEMS are used in both non-RECLAIM and RECLAIM applications. RECLAIM major sources are required to have continuous NOx emissions monitoring in the form of CEMS or district approved equivalent. CEMS systems in NOx RECLAIM are used to track NOx emissions at the equipment stack and calculates mass NOx emission averages in real time. RECLAIM CEMS are also used to transmit daily aggregate emission reports to District central station for RECLAIM reporting purposes. Facilities equipped with CEMS are required to conduct annual relative accuracy test audit (RATA) to demonstrate the accuracy of each system.

CEMS data from two units in RECLAIM facilities fired by natural gas equipped with SCR permitted with limits of 5 ppm were analyzed by staff to study the behavior of equipment emissions throughout the span of an operational year. The analyzed data show while facility's RATA results demonstrated emissions that were considerably (>30%) lower than the permit limit, CEMS readings demonstrated that the real world emissions (in ppm @ 3% O2) from major sources with permit limit of 5 ppm often fluctuate from 3 ppm to 4.5 ppm even though facility passed annual RATA or periodic source tests with emissions results of <3.5 ppm. Results from this analysis were considered for preliminary staff BARCT recommendations.

Assessment of Pollution Control Technologies

Ultra-Low NOx Burners Systems

For gaseous fuels, thermal NOx is generally the largest contributor of NOx emissions. High flame temperatures trigger the disassociation of nitrogen molecules from combustion air and a chain reaction with oxygen follows to form oxides of nitrogen. Factors that minimize the formation of thermal NOx include reduced flame temperature, shortened residence time, and an increased fuel to air ratio. To reduce NOx emissions, combustion parameters can be optimized, control techniques can be applied downstream of the combustion zone, or a combination of the two approaches can be utilized. Common types of combustion modification include: lowered flame temperature; reduced residence time at high combustion temperature; and reduced oxygen concentration in the high temperature zone.

There are a variety of configurations and types of burners for ultra-low NOx burner (ULNB) systems. Often, fuel and air are pre-mixed prior to combustion. This results in a lower and more uniform flame temperature. Some premix burners also use staged combustion with a fuel rich zone to start combustion and stabilize the flame and a fuel lean zone to complete combustion and reduce the peak flame temperature. These burners can also be designed to spread flames over a larger area to reduce hot spots and lower NOx emissions. Radiant premix burners with ceramic, sintered metal or metal fiber heads spread the flame and produce more radiant heat. When a burner produces more radiant heat, it results in less heat escaping the boiler through the exhaust gases.

Most premix burners require the aid of a blower to mix the fuel with air before combustion takes place (primary air). A commonly used application in combination with these burners is flue gas recirculation (FGR). FGR recycles a portion of the exhaust stream back into the burner. Increasing the amount of primary air and/or use of FGR can reduce flame temperature but it also reduces the temperature of combustion gases through dilution and can reduce efficiency. To maintain efficiency a manufacturer may have to add surface area to the heat exchanger. Increasing the primary air may also destabilize the flame. Ultra-low NOx burners require sophisticated controls to maintain emissions levels and efficiency, to stabilize the flame, and to maintain a turndown ratio that is sufficient for the demands of the particular operation.

It was noted in the 2008 staff report to Rule 1146 and 1146.1 that there was clear evidence that these types of burners had been successfully retrofitted on boilers and heaters according to SJVAPCD in their Rule 4306. Source tests that were conducted in conjunction with Rule 4306 showed a 98% compliance rate with a 9 ppm NOx limits using ultra-low NOx burners. In 2010, SCAQMD staff published a technology assessment report discussing the implementation assessment of ultra-low NOx burners subject to Rules 1146 and 1146.1. The report concluded that the 9 ppm NOx limit can be achieved by ultra-low NOx burner systems for boilers and process heaters greater than 2 MMBtu/hour. There were ultra-low NOx burners from 16 different manufacturers that could achieve the 9 ppm NOx compliance limit.

Selective Catalytic Reduction (SCR) Systems

SCR is a post-combustion control technology that is a commercially available commonly employed to control NOx emissions from boilers and other NOx sources. It is considered to be BARCT, if cost-effective, for controlling NOx emissions from existing combustion sources such as boilers and process heaters. A typical SCR system design consists of an ammonia storage tank, ammonia vaporization and injection equipment, a booster fan for the flue gas exhaust, an SCR reactor with catalyst, an exhaust stack plus ancillary electronic instrumentation and operations control equipment. The technology uses a precious metal catalyst that selectively reduces NOx in the presence of ammonia. Ammonia is injected in the flue gas stream where it reacts with NOx and oxygen in the presence of the catalyst to produce nitrogen and water vapor.

For conventional SCRs, the minimum temperature for NOx reduction is 500 degrees F and the maximum operating temperature for the catalyst is 800 degrees F. Depending on the application, the type of fuel combusted, and the presence of sulfur compounds in the exhaust gas, the optimum flue gas temperature of an SCR system is case-by-case and will range between 550 degrees F and 750 degrees F to limit the occurrence of several undesirable side reactions at certain conditions. Depending on the type of combustion equipment utilizing SCR technology, the typical amount of ammonia slip can vary between less than five ppmv when the catalyst is fresh and 20 ppmv at the end of the catalyst life. However, newly permitted SCR systems have an ammonia slip limit of 5 ppmv. In addition to the conventional SCR catalysts, there are high temperature SCR catalysts

that can withstand temperatures up to 1200 degrees F and low temperature SCR catalysts that can operate below 500 degrees F.

Based on the 2008 staff reports for Rule 1146 and 1146.1, SCR as applied to Rule 1146 boilers can achieve NOx concentrations from 5 to 6 ppm for units greater than or equal to 75 MMBtu/hr.

Other Potential Technologies

The following section summarizes an alternative technology that may have the potential to reduce NOx emissions for this source category.

ClearSign Technology

ClearSign Combustion Corporation in Seattle has developed two technologies applicable for boilers and heaters: DUPLEX™ technology and Electrodynamic Combustion Control (ECC™). DUPLEX™ technology can be installed in new boilers or heaters, or retrofit in existing boilers and heaters. The DUPLEX technology comprises a proprietary DUPLEX tile installed downstream of conventional burners. The hot combustion flame from the conventional burners impinges onto the DULEX tile, and the tile helps radiate heat evenly with high emissivity to the combustion products. DUPLEX operation also creates more mixing and shorter flames. Since the flame length is one parameter that limits the total heat release in a furnace, decreased flame length can allow for significantly higher process throughputs. DUPLEX tile is expected to have a 3- to 5-year life. The Electrodynamic Combustion Control (ECC™) uses an electric field to effectively shape the flame, accelerate flame speed, and improve flame stability. The total electrical field power required to generate such effects is less than 0.1% of the firing rate. Bench test performance estimates for DUPLEX and ECC indicated that NOx and CO were less than 5 ppmv, when furnace temperatures were steady maintained between 1200 and 1800 degrees F.

In San Joaquin Valley, this technology has been installed in two small refinery heaters, three oilfield steam generators, and six enclosed flares. While it is a promising technology, more testing/demonstration would be needed before sustainability / durability is proven.[4]

Vendors Discussion

Ultra-low NOx burners systems

Except for atmospheric units and thermal fluid heaters, the current NOx limit for units burning gaseous fuels, excluding digester and landfill gases, with a rated heat input between 2 and 75 MMBtu/hr is 9 ppm. From the information obtained through vendor discussions, lower NOx emissions with ultra-low NOx burners are feasible for new and retrofit units under 50 MMBtu/hr. For certain applications, achieving 5 ppm NOx limit with an ultra-low NOx burner without SCR is feasible, but only for new units. Based on vendor discussions, retrofits on existing units could potentially meet 7 ppm or less. However, there are some limitations for 7 ppm retrofits. Existing units need to have a minimum furnace size and the proper back and steam pressure, as well as additional controls, such as variable frequency drive and oxygen trim, to achieve 7 ppm or less. In addition to these factors, 7 ppm or less with ultra-low NOx burners are limited to fire-tube boilers and not currently feasible for water-tube boilers. The difference between water-tube and fire-tube boilers is that a water-tube boiler circulates water through a series of tubes, the tubes are heated externally by the combustion gas, and the surrounding hot gases heat the water in the steam-generating tubes, whereas a fire-tube boiler passes combustion gasses inside a series of tubes that are surrounded by a closed vessel of water that is heated to produce steam.

[4] "Clearsign Ultra Low NOx Technology", San Joaquin Valley APCD, November 7-8 2017.

SCR Systems

The NOx emission limit specified in Rule 1146 for Group I units is 5 ppm, which is met with the use of SCR. SCR systems are scalable and generally utilized for units greater than 10 MMBtu/hr. Based on the information obtained through vendor discussions, it is potentially feasible for retrofit units to meet 4 ppm or less. While it is currently not feasible for vendors to guarantee 3 ppm or less for SCR retrofits, there are some applications that can achieve 4 ppm or less. However, there are several limitations for SCR retrofits to meet 4 ppm or less, such the age, flow, and size of the catalyst bed of the existing SCR system. The existing catalyst bed might not be large enough to comply with both the lower NOx limit and the 5 ppm ammonia slip limit. Additionally, a NOx feedback analyzer will most likely be needed in order to maintain the lower NOx levels. The most significant constraint is the inadequate safety margin between the permitted limit and the actual emissions to account for fluctuations in external factors such as ambient temperature or fuel heat input (i.e. gas Btu).

Atmospheric Units

Atmospheric units are currently required to meet 12 ppm NOx in Rules 1146 and 1146.1. Although manufacturers and vendors can provide new atmospheric units with ultra-low NOx burners to meet 9 ppm, this lower limit would not be feasible for all retrofit applications. Since fluctuations in ambient conditions affect atmospheric units more than sealed combustion units, a 9 ppm NOx emission limit is currently not feasible for retrofit units.

Thermal Fluid Heaters

The NOx emission limit for thermal fluid heaters in Rules 1146 and 1146.1 is currently 30 ppm. Thermal fluid heaters typically operate at much higher temperatures than process heaters that use water as the heating fluid, which could result in higher NOx emissions. Based on discussions with vendors, thermal fluid heaters with ultra-low NOx burners guaranteed to meet 20 ppm or less are available. While 9 ppm is available for new units of certain applications, existing units could be retrofitted to meet 15 to 12 ppm. However, there could be some loss in efficiency for the units since premix combustion burners requires higher percentage of oxygen.

Landfill and Digester Gas Fired Units

The NOx emission limit for digester gas fired units in Rules 1146 and 1146.1 is currently 15 ppm. Based on discussions with vendors, digester gas fired units can be guaranteed to meet 12 ppm, while 9 ppm is dependant on fuel composition and heating value which can vary depending on facility. Sub 7 ppm is not feasible due to the presence of H_2S. Lowering digester gas emissions might also cause an increase in CO emissions.

Low-Fuel Use Units

Rule 1146 and 1146.1 each include a provision for units that operate with low fuel usage. The low fuel use provisions limit annual usage to <90,000 therms/year and <18,000 therms/year, in Rule 1146 (c)(5) and Rule 1146.1 (c)(4) respectively. As a matter of illustration, the operating capacity for a 10 MMbtu/hr unit with an annual usage of 90,000 therms/year is approximately 11 percent. The annual fuel usage limit is listed as a condition in the permit, and is used for compliance determination. If a low fuel use unit exceeds the fuel usage limit in the permit, the operator or owner of the unit shall demonstrate compliance with the BARCT emission limit within 18 months after the exceedance. Although low fuel use units are exempt from the BARCT emission limits, they are still subject to a NOx emission limit of 30 ppm (or 0.036 lbs/10^6 Btu). The 30 ppm limit was established based on the "off-the-shelf" technology that was available back in the technology assessment of the 2008 amendments. As part of the current BARCT assessment, the emission limit

for low fuel use units is reassessed. Whereas the BARCT emission limits, representing the *best* available retrofit control technology, for Group I, Group II and Group III units vary from 5 to 9 ppm, the current "off-the-shelf" technology for a *basic* retrofit for a natural gas fired unit is 12 ppm. The emission limit of 12 ppm was based on discussion with vendors, taking into the consideration that many of the low fuel use units have a higher equipment life and they have been in operation for more than 30 years. Nonetheless, given the low fuel usage, it is not cost effective to require immediate retrofits for these units (see the cost effectiveness section for more details). Therefore, it is recommended for low fuel use units to meet a NOx emission limit of 12 ppm upon replacement of burner.

Summary of BARCT Technology Assessment for Rules 1146 and 1146.1

Based on the review of the types of pollution control technologies available to reduce NOx emissions applicable to the boilers, steam generators and process heaters subject to Rule 1146 and 1146.1, SCR and ultra-low NOx burners are still the main technologies that can achieve the NOx concentration limits specified in these rules.

Currently, there are three active landfill gas fired boilers located in SCAQMD, one is rated to 115 MMBtu/hr and the remaining two are identical units rated to 335 MMBtu/hr, all three units are operating burners designed for the orginal boiler from time of permit. Source test results from SMAQMD demonstrated the feasibility for a lower rated units (32.4 MMBtu/hr) to meet a limit of 15 ppm and one ULNB retrofitted landfill gas fired unit located in SJVAPCD has a permit limit of 9 ppm; however, all the landfill fired units located in SCAQMD are larger in size. All three landfill gas fired units located in SCAQMD are operating with burners that are the same as the models permitted between 1984 and 1990 (i.e. no permit modifications have been filed since original applications) and lowest permitted limit is 21 ppm. The NOx emission limit for landfill gas fired units in Rules 1146 and 1146.1 is currently 25 ppm. Based on discussions with vendors, landfill gas fired units should be able to meet concentration limits between 15 to 20 ppm depending on the methane and carbon dioxide concentration of the gas, which may differ between facilities. Based on the permit limit of 21 ppm at a large landfill gas fired unit in SCAQMD, and a number of medium size landfill gas fired units retrofits permitted between 9-15 ppm in SJVAPCD and SMAQMD, staff recommends to lower the emission limits to between 12 to 20 ppm for this category of equipment.

Analysis of source test results from digester gas fired equipment demonstrated that it is feasible for digester fired units to be retrofitted to meet a lower BARCT limit. According to Rules 1146 and 1146.1, digester gas fired units are currently limited to 15 ppm. However SJVAPCD is currently more stringent in their Rule 4320 with a limit of 9 to 12 ppm for all units fired with <50% PUC quality natural gas. Since SJVAPCD allows facilities to mix in up to 50% PUC quality natural gas in order to meet their rule limits, it allows facilities greater flexibility to demonstrate compliance to their rule limits. When comparing SCAQMD rule limits, which tests to 100% digester gas, units that are co-fired with up to 50% natural gas require emissions limit to be calculated by the weighted average of each fuel. When allotted for 50% mix of PUC quality natural gas and digester gas, the weighted average is around 12 ppm which is near SJVAPCD's rule limit. During the 2008 rule amendment for Rules 1146 and 1146.1, the compliance date for units fired with digester gas was set to January 1, 2015. As a result, most of the facilities retrofitted their units to meet the 15 ppm requirement recently. Given an average lifetime of 15 years for ULNB retrofits, the retrofitted units have a remaining lifetime of >10 years. By requiring facilities to meet a lower limit three years after the previous amended compliance date could possibly cause stranded assets. With this in mind, staff do not propose lowering BARCT of digester gas emission limits at this time.

Natural gas fired units make up for the majority of equipment subject to Rules 1146 and 1146.1. Currently, San Joaquin Valley APCD Rule 4320 limits units with greater than a 20 MMBtu/hr input rating to 7 ppm (or 5 ppm for compliance at a later date) with an option to comply with a mitigation fee. SJVAPCD staff shared source test and permitting information which demonstrated that compliance to their limits was being achieved without the need for facilities to comply with this mitigation fee option. Based on source test records, it is technically feasible to retrofit non-atmospheric units and thermal fluid heaters to meet a lower limit that is currently specified in Rules 1146 and 1146.1. Information obtained from vendor discussions confirms findings from source test analysis. Considerations were made on the operational differences between water-tube and fire-tube boilers which could impact the ability for equipment to come into compliance with staff's recommendations. With the information obtained, it is concluded that the NOx emission limits for natural gas fired units as currently required in Rule 1146 and 1146.1 may no longer be considered BARCT at the time of the proposed amendments. With additional considerations to the operational differences between water-tube and fire-tube boilers, staff proposes different limits for these types of boiler groups. Staff's recommendation based on theoretically feasibility is shown in Table 3

Table 3
Staff Recommendations for Rules 1146 and 1146.1

Group	Size (MMBtu/hr)	Recommended Emission Limit	Supporting Evidence
Rule 1146 Group I	≥75	5 ppm via SCR (same as existing limit)	N/A
Rule 1146 Group II	≥20 to <75	For units > 12 ppm: 5 ppm via SCR For units ≤ 12 ppm: Fire-tube boilers: 7 ppm via ULNB Water-tube boilers: 9 ppm via ULNB	• Existing permitted equipment currently equipped with SCR • Source test results from permitted equipment • Scalability of SCR technology from vendor discussions
Rule 1146 Group III	≥5 to <20	Fire-tube boilers: 7 ppm via ULNB Water-tube boilers: 9 ppm via ULNB	• Existing equipment permitted at 7 ppm • Source test result from permitted equipment • Vendor discussions backs up feasibility of 7 ppm retrofits for fire-tube equipment
Rule 1146.1	>2 to <5	Fire-tube boilers: 7 ppm via ULNB Water-tube boilers: 9 ppm via ULNB	• Source test result from permitted equipment • Vendor discussions backs up feasibility of 7 ppm retrofits for fire-tube equipment
Atmospheric Units	≤10	12 ppm via ULNB (same as existing limit)	N/A
Thermal Fluid Heaters	N/A	12 ppm via ULNB	• Existing equipment permitted at 12 ppm • Source test result from permitted equipment • Vendor discussions backs up feasibility of 12 ppm retrofits
Digester Gas Fired	N/A	15 ppm via ULNB (same as existing limit)	N/A
Landfill Gas Fired	N/A	12 to 20 ppm via ULNB	• Source test result from permitted equipment • Vendor discussion • Existing equipment permitted at 9 ppm

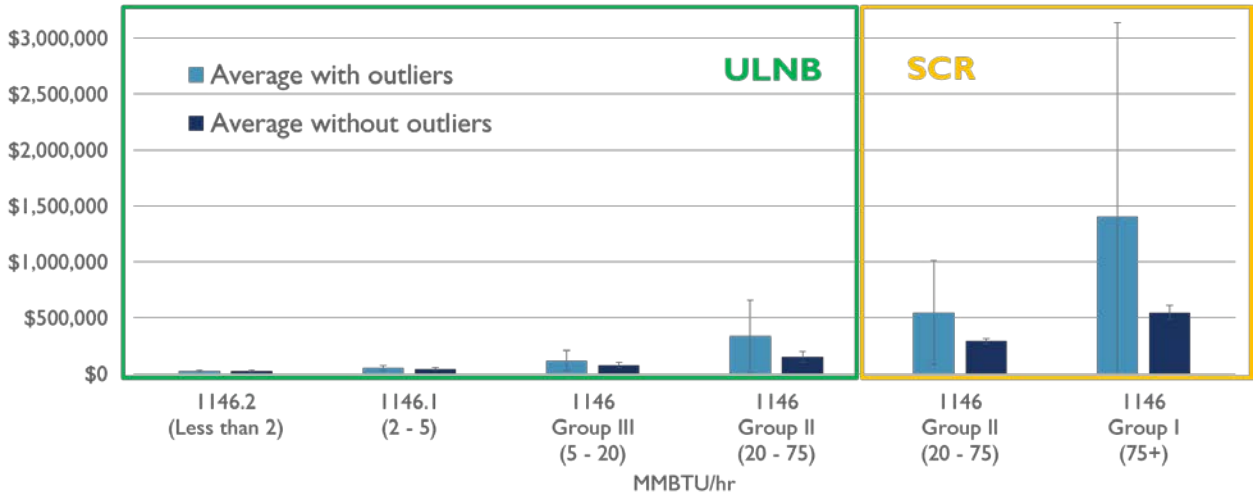
Cost Effectiveness Analysis

In order to assess the cost effectiveness for the proposed BARCT limits, cost information about the control equipment was obtained from discussions with manufacturers and vendors, as well as

from the U.S. EPA SCR Cost Manual[5]. The cost for the control equipment consists of two main components, the capital cost and annual cost. The capital cost is a one-time expense of the equipment, installation, and permitting fees, whereas the annual operating cost includes any recurring expense, such as the cost for electricity, operation and maintenance (O&M), monitoring, and consumables like ammonia and catalyst.

Cost estimates for the equipment and installation were obtained from 5 vendors. The cost depended on the equipment size, NOx emission limit, and the type of retrofit control technology (ultra-low NOx burner or SCR). The budget prices obtained assumed the cost was for retrofits only, that there would be no major changes to existing units such as major structural or foundation changes. Additionally, the equipment lifespan was assumed to be 15 years for ultra-low NOx burners and 25 years for SCR. As shown in the graph below, when the average costs were compared, there were substantial deviations because of outlier prices obtained from one vendor. To be conservative, the cost effectiveness analysis is based on the average cost including the outlier. In addition to the average cost for the equipment and installation, the permitting fees are included as part of the capital cost in the cost effectiveness analysis. The most current fee rates in Rule 310 were used to estimate the permitting cost for each category grouped by unit size.

Figure 2
Average Cost with Outliers



The recurring expenses included in the annual cost were additional electrical, O&M, and monitoring expenses, as well as ammonia and catalyst consumption that are not already required for the existing operation. Additional details of the annual costs that were included in the cost effectiveness analysis are provided in the following sections.

Additional electrical cost

For ultra-low NOx burner retrofits, the potential cost increase for electricity is from the use of flue gas recirculation (FGR), which requires additional energy due to the higher dilution. However, there are potential savings gained with a new burner since the new burner would have greater efficiency and higher turndowns compared to the older burner. Additionally, the installation of VFD and oxygen sensors can reduce the electrical cost. Therefore, the cost effective analysis for

[5] U.S. EPA SCR Cost Manual available at: https://www3.epa.gov/ttn/ecas/docs/SCRCostManualchapter7thEdition_2016.pdf.

ultra-low NOx burner retrofits does not account for additional electrical cost. For SCR retrofits, there will be a cost increase due to the additional energy consumption required for the higher pressure drop, ammonia vaporization, and induction fan associated with the SCR system. The additional energy consumption was calculated using the U.S. EPA SCR Cost Manual, where the estimated power consumption (kW) for the SCR system depended on the unit's rated heat input capacity (MMBtu/hr). The cost was determined assuming a 50% operating capacity and an industrial electricity rate of 12.68 cent per kW-hr [6]. Although, there are additional electrical cost with an SCR system, there are potential savings for units currently using FGR. After installing SCR, units that currently use FGR could reduce or eliminate the use of FGR, since the NOx emissions could primarily be control by the SCR system rather than with FGR. Therefore, savings based on the percentage of existing non-compliant units with FGR was accounted for when calculating the potential increase in electrical cost. Approximately 80% of units between 20 and 75 MMBtu per hour currently use FGR. The savings were estimated by calculating the annual electrical cost for the energy consumption of FGR based on the average heat input of the burners in Group I and Group II of Rule 1146. The total savings applied in the cost effective analysis was assumed to be the difference in electrical cost from the reduction in FGR utilization of 30% down to 15%. This potential savings in electrical cost for each non-compliant units assumed to be utilizing FGR was distributed among the total number of non-compliant units in each group category.

Ammonia and catalyst cost

SCR uses catalyst and ammonia to selectively reduce NOx. Ammonia is injected into the flue gas stream where it reacts with NOx and oxygen within the catalyst to produce nitrogen and water vapor. The U.S. EPA SCR Cost Manual was used to estimate, based on the unit's rated heat input and a 50% operating capacity, the consumption rate of ammonia and the catalyst volume required to reduce NOx emission from 30 ppm down to 5 ppm with an ammonia slip limit of 5 ppm. The average price of 19% aqueous ammonia obtained from two suppliers was used to determine the recurring cost for the SCR ammonia consumption. As for the catalyst, according to discussions with vendors, the catalyst replacement frequency is between 7 to 12 years. Therefore an average replacement frequency of 9 years and a catalyst replacement cost of $258.80 per cubic foot[7] was assumed to estimate the recurring catalyst cost.

Additional O&M cost

For the O&M cost included in the cost effectiveness analysis was only the recurring annual cost for labor and materials that are not already part of the existing operations. Existing burners already have service contracts in place, plus there would most likely be less maintenance and fewer repairs for the retrofit burner. Also, additional controls, such as oxygen sensors for O_2 trim would reduce the combustion tuning frequency of a burner without these controls. The oxygen sensors have typical lifespans of 10 – 15 years similar to the ultra-low NOx burners. Therefore no additional O&M cost were accounted for in the cost effectiveness analysis for ultra-low NOx burner retrofits. For a retrofit with an SCR system, there will be additional O&M costs compared to a unit with no SCR. The additional O&M cost associated with SCR retrofits accounted for the recurring expense of annual SCR maintenance checks. According to the U.S. EPA SCR Cost Manual, the annual

[6] U.S. Energy Information Administration Electric Power Monthly Reports (data for the monthly price of electricity for industrial sector in California was used to calculate the annual average for the months of June 2017 – June 2018)
[7] December 2015 Staff Report for NOx RECLAIM Amendments to Regulation XX – Regional Clean Air Incentives Market (RECLAIM)

maintenance labor and material cost for an SCR system was assumed to be 0.5% of equipment and installation cost.

Additional monitoring cost

Emissions monitoring was considered separately from the O&M cost. The monitoring cost included in the cost effectiveness analysis was the additional cost for monitoring, reporting, and recordkeeping (MRR) that is not already required for the existing operations. RECLAIM or former RECLAIM Title V facilities will continue with their current MRR requirements specified in Rule 2012, whereas non-Title V facilities would transition to the command-and-control landing rule requirements. Except for reporting requirements, the MRR requirements for Rule 2012 are comparable to command-and-control MRR requirements for Rules 1146 and 1146.1. Since the MRR requirements will either remain the same or be similar to the existing requirements, no additional monitoring cost was considered in the cost effectiveness analysis for ultra-low NOx burner retrofits. On the other hand, since SCR systems will have an ammonia emission limit, there will be additional monitoring cost due to the annual ammonia slip test. The ammonia slip source test was estimated to be $3,333 per year based on information obtained from discussions with vendors.

For RECLAIM facilities, substantial reporting requirements are currently required pursuant to Rule 2012, and the transition into a command-and-control rule would not impose additional monitoring costs. Instead, since RECLAIM has extensive reporting requirements, as discussed in Appendix A, it is anticipated that there might be potential cost savings in MRR for some facilities by transitioning into the command-and-control rule. For instance, RECLAIM facilities are required to electronically report their emissions daily for major source units, monthly for large source units and quarterly for other units, in addition to the quarterly certification of emissions and annual permit emissions reports. In contrast, Rule 1146 only requires units with CEMS to report their emissions once every 6 months pursuant to Rule 218 – Continuous Emission Monitoring. The potential savings due to the change in reporting requirements as they transition from RECLAIM to Rule 1146 was estimated based on the approximated annual staffing cost that would be needed to fulfill RECLAIM reporting requirements. The potential savings, for non-Title V facilities only, were approximated to be $40,000 and $2,000 per piece of major and non-major sources, respectively. Additionally, since the annual heat input threshold for CEMS applicability is lower in RECLAIM, it is possible that a piece of equipment required to maintain a CEMS under RECLAIM Rule 2012 might not be required to maintain the CEMS when it is subject to Rule 1146. However, due to the uncertainty in quantifying the potential cost savings for facilities impacted by the change in the CEMS applicability threshold as they transition from RECLAIM into Rule 1146, this potential savings was not included in the cost effectiveness analysis.

Table 4
Cost Effectiveness Analysis

Group	Size (MMBtu/hr)	Preliminary Recommended Emission Limit	Cost Effectiveness ($/ton)	
Rule 1146 Group I	≥75	5 ppm via SCR (existing limit)	$17,000*	
Rule 1146 Group II	≥20 to <75	5 ppm via SCR	For units > 12 ppm*	
			$33,000	
Rule 1146 Group II	≥20 to <75	7 ppm via ULNB for fire-tube boilers 9 ppm via ULNB for non fire-tube boilers	For units ≤ 12 ppm	
			$14,000 compliance until burner replacement or 15 yrs after amendment	
Rule 1146 Group III	≥5 to <20	7 ppm via ULNB for fire-tube boilers 9 ppm via ULNB for non fire-tube boilers	For units > 12 ppm*	For units ≤ 12 ppm*
			$27,000	$10,000 compliance until burner replacement or 15 yrs after amendment
Rule 1146.1	≥2 to <5	Same as above	For units > 12 ppm*	For units ≤ 12 ppm*
			$36,000	$10,000 compliance until burner replacement or 15 yrs after amendment
Atmospheric Units	≤10	12 ppm via ULNB (existing limit)	$34,000^	
Thermal Fluid Heaters	NA	12 ppm via ULNB	$39,000^	
Digester Gas Fired	NA	15 ppm via ULNB (existing limit)	Not applicable	
Landfill Gas Fired	NA	12 - 20 ppm via ULNB	$17,000#	

** Estimated using emissions from RECLAIM units*
^ Estimated assuming 20% operating capacity and a baseline of 30 ppm
 # Estimated assuming retrofit to meet 20 ppm

It should be noted that Rule 1146 and 1146.1 each include a provision for units that operate with low fuel usage. The low fuel use provisions limit annual usage to <90,000 therms/year and <18,000 therms/year, in Rule 1146 (c)(5) and Rule 1146.1 (c)(4) respectively. Although it is technically feasible for low use units to retrofit to meet the BARCT emission limits, the resulting emission reductions would be low leading to lower cost effectiveness (> $50,000 per ton of NOx reduced). For example, the cost effectiveness for a 10 MMBtu/hr water-tube boiler operating at 90,000 therms/year to meet the BARCT emission limit of 9 ppm is about $56,000/ton. For the same boiler with a fuel usage of 45,000 therms/year, the cost effectiveness is approximately $112,000/ton. Due to their lower operations and potential emission reductions, it is not cost effective for low use units to retrofit to meet the BARCT emission limits.

Summary of NOx BARCT Emission Limit

Staff's preliminary recommendation for the BARCT emission limits are established using information gathered from existing SCAQMD regulations, existing permitted units located in SCAQMD, regulatory requirements for other air districts, existing permitted units located in other air districts, the technology assessment, and considerations for application specific limitations. Both retrofits and new installations are considered. Staff recommendations for NOx BARCT can be found in the table below:

Table 5
Staff's Preliminary Recommendations for NOx BARCT*

Unit Description	Recommended NOx Emission Limits and Compliance Dates			
Rule 1146	**Units >5 ppm**	**Units ≤5 ppm**	**Compliance Date >5 ppm**	**Compliance Date ≤5 ppm**
≥75 MMBtu/hour (Rule 1146 Group I)	5 ppm via SCR (same as existing limit)	In compliance with rule limit	75% of 1146 & 1146.1 units by Jan 2021 100% of 1146 & 1146.1 units by Jan 2022 Replacement by Jan 2023	No Action Needed
Rule 1146 and 1146.1	**Units >12 ppm**	**Units ≤12 ppm**	**Compliance Date >12 ppm**	**Compliance Date ≤12 ppm**
≥20 to <75 MMBtu/Hour (Rule 1146 Group II)	5 ppm via SCR	Fire-tube: 7 ppm via ULNB Water-tube: 9 ppm via ULNB	Same as above	Burner replacement or 15 yrs after amendment (for both RECLAIM and non-RECLAIM)
≥5 to <20 MMBtu/Hour (Rule 1146 Group III) >2 to <5 MMBtu/Hour (Rule 1146.1)	Fire-tube: 7 ppm via ULNB Water-tube: 9 ppm via ULNB	Fire-tube: 7 ppm via ULNB Water-tube: 9 ppm via ULNB		
Atmospheric Units ≤10 MMBtu/Hour	12 ppm via ULNB (same as existing limit)	In compliance with rule limit		No Action Needed
Thermal Fluid Heaters	**Units >20 ppm**	**Units ≤20 ppm**	**Compliance Date >20 ppm**	**Compliance Date ≤20 ppm**
All Sizes	12 ppm via ULNB	12 ppm via ULNB	Same as above for RECLAIM facilities Jan 2022 for non-RECLAIM facilities	Burner replacement or 15 yrs after amendment (for both RECLAIM and non-RECLAIM)
Digester Gas Fired Units	**Units >15 ppm**	**Units ≤15 ppm**	**Compliance Date >15 ppm**	**Compliance Date ≤15 ppm**
All Sizes	15 ppm via ULNB (same as existing limit)	In compliance with rule limit	Not applicable	No Action Needed
Landfill Gas Fired Units	**Units >20 ppm**	**Units ≤20 ppm**	**Compliance Date >20 ppm**	**Compliance Date ≤20 ppm**
All Sizes	12 - 20 ppm via ULNB, seeking comment		Jan 2022	Burner replacement or 15 yrs after amendment

**It is important to note that boilers and heaters operated in petroleum refineries would most likely be subject to a lower NOx concentration limit. This is based on the size and operations characteristics that is associated with that particular industry*

CONTROL TECHNOLOGY ASSESSMENT FOR RULE 1146.2 EQUIPMENT

As part of the technology assessment under the 2006 amendment for Rule 1146.2, source test reports conducted for the Rule 1146.2 Certification Program were analyzed to assess the advancement in pollution control technologies. It was found that low-NOx burners for boilers and heaters in this size range can achieve less than 10 ppm NOx (at 3% oxygen). In particular, about 15% of the Type 2 units (more than 400,000 Btu/hr) had a certification level of less than 10 ppm of NOx, indicating that Type 2 units are capable of meeting a lower emission level at 12 ppm. Although a lower NOx emission limit was technically feasible at the time of the 2006 amendment, the average cost effectiveness for the 12 ppm emission limit was $24,100, which was considerably higher than the then-proposed emission limit of 20 ppm (average cost effectiveness = $2,400). Due to the relatively high cost of implementing the 12 ppm emission limit for Type 2 units in 2006, the 20 ppm emission limit was proposed and adopted in the 2006 amendment.

Analysis of NOx Concentration Limits for Rule 1146.2 Equipment at Other Air Districts
To evaluate for potential BARCT advancement from the 2006 amendment, staff has evaluated the following analogous rules in other California Air Districts:

- SJVAPCD Rule 4308 Boilers, Steam Generators, and Process Heaters – 0.075 MMBtu/hr to Less Than 2.0 MMBtu/hr
- SMAQMD Rule 411 NOx from Boilers, Process Heaters and Steam Generators
- SMAQMD Rule 414 Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 Btu Per Hour
- VCAPCD Rule 74.15.1 Boilers, Steam Generators and Process Heaters 1 to 5 MMBTUs

- VCAPCD Rule 74.11.1 Large Water Heaters and Small Boilers
- BAAQMD Regulation 9 Rule 6 Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters

SCAQMD staff evaluated the requirements contained within the analogous rules and found no requirements that were more stringent than those already in Rule 1146.2.

Summary of BARCT Technology Assessment for Rule 1146.2

Based on the above information, there is a potential opportunity to lower the NOx concentration emission limit for Rule 1146.2. However, amending the NOx concentration limit will affect both RECLAIM and non-RECLAIM sources, and requires a much more extensive rulemaking process. Since a major objective is to initiate the transition of RECLAIM facilities into a command-and-control regulatory structure with highest priority given to older, higher polluting units that will need to install retrofit controls, staff is not proposing changes to the NOx concentration limit for Rule 1146.2 equipment at this time. Staff is committed to return to Rule 1146.2 to further assess the advancement and the cost effectiveness of advanced control technologies for this source category.

CHAPTER 3: SUMMARY OF PROPOSALS

INTRODUCTION

PROPOSED AMENDED RULE 1146

PROPOSED AMENDED RULE 1146.1

PROPOSED AMENDED RULE 1146.2

PROPOSED RULE 1100

TRANSITION LOGISTICS

INTRODUCTION

The primary objectives of PARs 1146, 1146.1, and 1146.2 are to establish BARCT requirements for equipment regulated under these rules and to remove the exclusion of RECLAIM facilities. Additional definitions and provisions were needed to clarify the revised requirements for the applicable facilities. The key revisions to the rules are discussed below.

PROPOSED AMENDED RULE 1146

Rule 1146 Applicability (Subdivision (a))

Rule 1146 applies to boilers, steam generators, and process heaters of equal to or greater than 5 MMBtu/hr of rated heat input capacity used in all industrial, institutional, and commercial operations with the exception of boilers used by electric utilities to generate electricity (or electricity generating facilities, EGFs), boilers and process heaters with a rated heat input capacity greater than 40 MMBtu/hr that are used in petroleum refineries, sulfur reaction plant boilers, and units operated at RECLAIM facilities pertaining to NOx emissions only.

The proposed amendments would revise and move these exceptions from subdivision (a) – Applicability to a new subdivision (f) – Exemptions.

Rule 1146 Definitions (Subdivision (b))

The following definitions were added to Rule 1146 to distinguish different boiler types, facility types, and consistently define the meaning of modification.

FIRE-TUBE BOILER in paragraph (b)(8), which means:

> *"any BOILER that passes hot gases from a fire box through one or more tubes running through a sealed container of water. The heat of the gases is transferred through the walls of the tubes by thermal conduction, heating the water and ultimately creating steam."*

FORMER RECLAIM FACILITY in paragraph (b)(9), which means:

> *"a facility that was in the Regional Clean Air Incentives Market, as established in Regulation XX, that has received a final determination notification, and is no longer in the RECLAIM program."*

MODIFICATION in paragraph (b)(17), which means:

> *"any physical change that meets the criteria set forth in Rule 1302 – Definitions."*

NON-RECLAIM FACILITY in paragraph (b)(18), which means:

> *"a facility that is not and never was in the Regional Clean Air Incentives Market, as established in Regulation XX."*

RECLAIM FACILITY in paragraph (b)(23), which means:

> *"a facility that is currently in the Regional Clean Air Incentives Market, as established in Regulation XX."*

Rule 1146 Requirements (Subdivision (c))

Prior to this amendment, RECLAIM facilities were not required to comply with the command-and-control NOx limits in Rule 1146 because of the exemption specified in subdivision (j) of Rule 2001 and paragraph (a)(4) of the current Rule 1146. In order to remove this exemption, subdivision (c) will have the following notwithstanding clause:

> *"Notwithstanding the exemptions contained in Table 1 – Existing Rules Not Applicable to RECLAIM Facilities for Requirements Pertaining to NOx Emissions, of subdivision (j) of Rule 2001, the owner or operator of any unit(s) subject to this rule shall not operate the unit in a manner that exceeds the emission limits specified in (c)(1), (c)(2), (c)(3), and (c)(4)."*

RECLAIM and former RECLAIM facilities with equipment subject to Rule 1146 will be required to comply with the proposed emission limit that is specified in paragraph (c)(1) based on the applicable category in Table 1146-1, which represents current BARCT. The implementation schedule will be detailed in PR 1100, as specified in subparagraph (e)(1).

The NOx limits are presented in Table 6 which is also in PAR 1146 Table 1146-1. This table changed certain units in Group II, Group III, and thermal fluid heaters from the current Rule Table 1146-1. The table was also updated to remove the three columns specifying dates for submittal of compliance plans and permit applications. Also removed was the criteria for the previously required compliance plans that was specified in paragraph (c)(9).

Table 1146-2 and paragraph (c)(2), the enhanced compliance limits for Group II units was removed. These enhanced limits and compliance dates are no longer applicable to the proposed amendment, given that the compliance dates have passed and that the standard limit for Group II has been revised in Table 1146-1 to 5 ppm or 0.0062 lbs/10^6 Btu

Paragraph (c)(2) was replaced to specify an ammonia slip limit as follows:

> *"The owner or operator of any unit(s) operating with an air pollution control equipment that results in ammonia emissions in the exhaust shall not discharge into the atmosphere ammonia emissions in excess of 5 ppm (referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes)."*

The ammonia emission limit of 5 ppm is consistent with the current BACT limit and would apply to units that are installed or modified on or after the date of the proposed amendment. As specified in paragraph (c)(8), existing non-RECLAIM units installed or modified prior to the proposed amendment that are currently permitted with an ammonia emission limit greater than 5 ppm do not have to meet the ammonia emission limit in paragraph (c)(2) until the air pollution control equipment is replaced or modified.

Table 6
Rule 1146-1 Compliance Limits

Rule Reference	Category	Limit[1]	Compliance Schedule for NON-RECLAIM Facilities	Compliance Schedule for RECLAIM and FORMER RECLAIM Facilities
(c)(1)(A)	All Units Fired on Gaseous Fuels	30 ppm or for natural gas fired units 0.036 lbs/10^6 Btu	September 5, 2008	See Rule 1100 – Implementation Schedule for NOx Facilities
(c)(1)(B)	Any Units Fired on Non-gaseous Fuels	40 ppm	September 5, 2008	
(c)(1)(C)	Any Units Fired on Landfill Gas	12 to 20 ppm	January 1, 2022	
(c)(1)(D)	Any Units Fired on Digester Gas	15 ppm	January 1, 2015	
(c)(1)(E)	Atmospheric Units	12 ppm or 0.015 lbs/10^6 Btu	January 1, 2014	
(c)(1)(F)	Group I Units	5 ppm or 0.0062 lbs/10^6 Btu	January 1, 2013	
(c)(1)(G)	Group II Units (with an existing NOx limit >12 ppm)	5 ppm or 0.0062 lbs/10^6 Btu	January 1, 2016	
(c)(1)(H)	Group II Units (with an existing NOx limit ≤ 12 ppm)	7 ppm or 0.0085 lbs/10^6 Btu for fire-tube boilers only; 9 ppm or 0.011 lbs/10^6 Btu for all others	See (c)(7)(A)	
(c)(1)(I)	Group III Units (Fire-tube Boilers Only)	7 ppm or 0.0085 lbs/10^6 Btu	See (c)(7)(B)	
(c)(1)(J)	Group III Units (Excluding Fire-tube Boilers)	9 ppm or 0.011 lbs/10^6 Btu		
(c)(1)(K)	Thermal Fluid Heaters	12 ppm or 0.015 lbs/10^6 Btu	See (c)(7)(C) for units with an existing NOx limit ≤ 20 ppm See (e)(2) for units with an existing NOx limit >20 ppm	

[1]All parts per million (ppm) emission limits are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes.

Requirements for Low-Fuel Use Units

Paragraph (c)(5), which contains provisions for non-RECLAIM low-fuel usage units that have been in operation prior to September 5, 2008, was extended to also apply to low-fuel usage units in a RECLAIM or former RECLAIM facility that are in operation prior to the 12 months after the date of the proposed amendment with an annual heat input less than or equal to 9.0 x 10^9 Btu

(90,000 therms) per year. Any owner or operator that complies with the alternative compliance option specified in paragraph (c)(5) is still subject to a NOx emission limit of 12 ppm (or 0.036 lbs/10^6 Btu), pursuant to paragraph (e)(3). On or after January 1, 2015 or until burner replacement has been the compliance schedule specified in paragraph (e)(3) for non-RECLAIM low-fuel use units. Since this compliance schedule will be retained, the applicable compliance deadline for low-fuel use units in RECLAIM or former RECLAIM facilities will be until burner replacement.

Requirements for Units Permitted at 12 ppm or less of NOx (or Thermal Fluid Heaters Permitted at 20 ppm or less of NOx)

In the 2008 amendments of Rules 1146 and 1146.1, a provision was included for natural gas units ranging from 2 to 20 MMBtu/hr to comply with the BARCT emission limits until the unit's burner(s) replacement, if the units complied with the then-applicable BACT limit of 12 ppm and were installed prior to the 2008 amendments. The provision was specified in Rule 1146 (c)(7) and Rule 1146.1 (c)(6), respectively (November 1, 2013 amendment).

Currently, there are a total of 97 RECLAIM units between 2 and 75 MMBtu/hr with NOx permit limits between 9 and 12 ppm. The reported emissions for these 97 units in 2016 totaled to 0.058 tpd of NOx. If these units were required to meet the proposed NOx concentration limits of 7 ppm, the estimated emission reductions would be 0.0063 tpd. Units that were permitted at or below 12 ppm were either retrofitted or required to meet a specific emission limit to meet BACT if the unit was new. Assuming an equipment life of 15 years for ultra-low NOx burners, the majority of these units might not have met their full useful life by the compliance date under PR 1100. Since it is not cost effective to require immediate retrofits for these units, a future compliance timeframe will be specified, as shown below, in Rule 1146 paragraph (c)(7) for units between 5 and 75 MMBtu/hr currently permitted to meet a NOx limit between 9 and 12 ppm and thermal fluid heaters permitted to meet a NOx limit of 20 ppm or less. These units will have to meet the applicable NOx emission limit by a date that is 15 years after the date of the proposed amendment or when 50 percent or more of the unit's burners are replaced. For units with multiple burners, each successive buner replacement after the date of rule amendment shall be added to the cumulative percentage of burners replaced. The same compliance timeframe will be specified in PR 1100 for units between 2 and 75 MMBtu/hr currently permitted to meet a NOx limit of 12 ppm or less and thermal fluid heaters permitted to meet a NOx limit of 20 ppm or less at a RECLAIM or former RECLAIM facility.

"(7) An owner or operator of a non-RECLAIM facility that has installed or modified the following units prior to [date of amendment] shall meet the specified NOx emission limit on [15 years after the date of amendment] or when 50 percent or more of the unit's burners are replaced, whichever is earlier:

(A) Group II units subject to subparagraph (c)(1)(H) with a NOx emission limit of 9 ppm or less as specified in a SCAQMD Permit to Operate; or

(B) Group III units subject to subparagraph (c)(1)(I) or (c)(1)(J) with a NOx emission limit of 12 ppm or less as specified in a SCAQMD Permit to Operate; or

(C) Thermal fluid heaters subject to subparagraph (c)(1)(K) with a NOx emission limit of 20 ppm or less as specified in a SCAQMD Permit to Operate."

Requirements for Biogas Units

Paragraph (c)(10), which applies to biogas units that are co-fired with natural gas, would require compliance with the emission limits in Table 1146-1 by each applicable compliance date for the selected unit under Rule 1100 for units located at a RECLAIM or former RECLAIM facility.

Rule 1146 Compliance Determination (Subdivision (d))

Subdivision (d) contains the compliance determination requirements for the equipment subject to this rule. Paragraph (d)(8) provides a clarification that is also contained in the Protocol for the Periodic Monitoring of Nitrogen Oxides, Carbon Monoxide, and Oxygen from Units Subject to SCAQMD Rules 1146 and 1146.1 (Combustion Gas Periodic Monitoring Protocol). The purpose of the clarification is to exclude units that are subject to continuous emission monitoring system (CEMS) requirements from the periodic monitoring requirements (or diagnostic emission checks) contained in Rule 1146. Paragraph (c)(6) contains the continuous emission monitoring requirements and the proposed language in paragraph (d)(8) excludes the units that are subject to CEMS from performing diagnostic emission checks. Subparagraph (d)(8)(A) specifies the periodic monitoring for NOx emissions that each owner or operator of units subject to paragraphs (c)(1), (c)(2), or (c)(4) must conduct. For units at a RECLAIM or former RECLAIM facility the NOx emissions checks will be required according to the monitoring schedule for the selected unit under Rule 1100. Subparagraph (d)(8)(B) would require a RECLAIM or a former RECLAIM facility to conduct NOx emission checks for low fuel usage units according to the existing tune-up schedule contained in subparagraph (c)(5)(B) during burner replacement.

Monitoring, Reporting and Recordkeeping Requirements

Staff compared monitoring reporting and recordkeeping requirements for Rule 1146, 1146.1, and 1146.2 to the monitoring and reporting requirements under RECLAIM. The detailed comparison is provided in Appendix A of this staff report. In general, most monitoring and recordkeeping requirements under RECLAIM were similar to the corresponding command-and-control rule. The most substantive difference was the threshold for continuous emissions monitoring systems. A discussion of the requirements of monitoring, recordkeeping, and reporting requirements for RECLAIM and non-RECLAIM facilities is presented below.

Non-Major Sources in Non-Title V Facilities

The requirements in monitoring and recordkeeping are comparable between RECLAIM and those specified in Rule 1146, Rule 1146.1, and Rule 1146.2. Since mass emissions are used for RTC reconciliation and compliance determination, the reporting requirements in RECLAIM include both monthly/quarterly electronic reporting, and quarterly and annual paper reporting. The corresponding requirement in Rule 1146 is a semi-annual report only for equipment subject to Rule 218 - *Continuous Emission Monitoring*. Given that the reporting requirements in RECLAIM were designed to ensure the integrity of the reported mass emissions, the reporting requirements might not be needed if the facilities are subject to Rule 1146 series, which determine compliance through a concentration limit. As such, non-major sources in non-Title V facilities would be subject to the MRR requirements in Rule 1146 series.

Major Sources in Non-Title V Facilities

Major sources in the RECLAIM program are required to be equipped with a Continuous Emission Monitoring System (CEMS). A Major source is defined in Rule 2012 (c)(1) as follows:

> (A) any boiler, furnace, oven, dryer, heater, incinerator, test cell and any solid, liquid or gaseous fueled equipment with a maximum rated capacity:

(i) greater than or equal to 40 but less than 500 million Btu per hour and an annual heat input greater than 90 billion Btu per year; or

(ii) 500 million Btu per hour or more irrespective of annual heat input;

In Rule 1146, any units with a rated heat input capacity greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200 billion Btu per year are required to install a continuous in-stack NOx monitor (CEMS-equivalent) (Rule 1146 (c)(6)). A comparison between the applicability thresholds in Rule 1146 and the RECLAIM program is shown in Table 7.

Table 7
Applicability Thresholds of CEMS in Rule 1146 and RECLAIM

	Rule 1146	RECLAIM
Size	40 MMBtu/hr	40 MMBtu/hr
Annual Fuel Usage	200 Billion Btu/year	90 Billion Btu/year

Since the applicability threshold in annual heat input is lower in RECLAIM, it is possible that a piece of equipment required to maintain a CEMS under RECLAIM Rule 2012 might not be required to maintain the CEMS when it is subject to Rule 1146. As discussed previously, mass emissions reported by RECLAIM facilities are used to track and demonstrate compliance in the RECLAIM program. To ensure the integrity of reported emissions, RECLAIM includes substantial monitoring and reporting requirements. As RECLAIM facilities transition into an equipment-based command-and-control regulatory structure, to the extent possible, they should be subject to the same regulatory requirements as other non-RECLAIM facilities that are currently regulated by the respective command-and-control rules. In particular, Rule 1146 was approved in the California State Implementation Plan (SIP) in 2014 (79 FR 57442). It was determined by EPA that Rule 1146 is consistent with the relevant policy and guidance as required under the Clean Air Act. Therefore, as RECLAIM facilities exit the RECLAIM program, PAR 1146 requires that Rule 1146 equipment at a former RECLAIM facility to be subject to the CEMS requirements in Rule 1146. In other words, a former non-Title V RECLAIM facility would be allowed to remove the CEMS that is equipped on a Rule 1146 unit, if the equipment size and annual heat input usage of the unit is lower than the CEMS applicability threshold as specified in Rule 1146.

To evaluate the potential impacts of the change in CEMS threshold as RECLAIM facilities transition into PAR 1146, the fuel usage records of RECLAIM units was retrieved for calendar year 2015 and 2016. Among the 22 units that exceed the equipment size threshold of $\geq$ 40 MMBtu/hr, four of them were defined as non-major sources under the RECLAIM program, as their annual heat inputs were less than the major source definition of 90 billion Btu per year as specified in Rule 2012 (c)(1). For these four units, CEMS would not be required under both Rule 1146 or RECLAIM requirements. Fifteen of the 18 major source units reported fuel usage data in 2015 / 2016. Four of these units had an annual fuel usage that exceeded 200 billion Btu per year. These units would be required to be equipped with CEMS under both Rule 1146 and the RECLAIM program. A total of eleven major source units reported fuel usage below 200 million Btu per year with 7 units that reported fuel usage below 90 million Btu per year, and 4 units reported fuel usage between 90 and 200 million Btu per year. Although the annual heat input of these 7 major source units fall below the CEMS applicability threshold in Rule 1146, they are equipped with CEMS, as required by all major source units in RECLAIM. Therefore, these units might have higher fuel usage records before year 2015, which was not captured in this analysis. To be conservative, a total of 11 Rule 1146 major source units is estimated to be potentially

impacted by the change in the CEMS applicability threshold as they transition from RECLAIM into Rule 1146, and they may potentially remove the CEMS currently equipped with the unit, dependent upon future fuel usage of each unit.

Title V Facilities

Title V is a federal program designed to standardize air quality permits and the permitting process for "major sources" of emissions across the country. EPA defines a "major source" as a facility that emits, or has the potential to emit (PTE) any criteria pollutant or hazardous air pollutant (HAP) at levels equal to or greater than the Major Source Thresholds (MST), which may vary depending on the attainment status (e.g. marginal, serious, extreme) of the geographic area and the criteria pollutant or HAP in which the facility is located. Title V requires additional periodic monitoring for the SIP-approved, federally enforceable rules that do not contain sufficient monitoring requirements to assure compliance with the emission limitations or other requirements. SCAQMD has developed guidelines, outlined in SCAQMD Periodic Monitoring Guidelines[8], for periodic monitoring, testing and recordkeeping requirements that may be incorporated in Title V permits. Currently, the monitoring requirements in the RECLAIM program are comprehensive and address the Title V periodic monitoring requirements. Therefore, RECLAIM Title V facilities will continue to comply with the monitoring, reporting, and recordkeeping requirements specified in Rule 2012.

Rule 1146 Compliance Schedule (Subdivision (e))

Subdivision (e) contains the compliance schedule provisions for units at a RECLAIM or former RECLAIM facility and for thermal fluid heaters at a non-RECLAIM facility. Paragraph (e)(1) references the compliance schedule specified in Rule 1100 for RECLAIM or former RECLAIM facilities, since Rule 1100 will contain the implementation schedules for the units that will be transitioning out of the RECLAIM program.

> *(1) The owner or operator of a RECLAIM or former RECLAIM facility with any unit(s) subject to paragraph (c)(1) shall meet the applicable NOx emission limit in Table 1146-1 in accordance with the schedule specified in Rule 1100 – Implementation Schedule for NOx Facilities.*

As stated below, Paragraph (e)(2) will specify the compliance schedule for non-RECLAIM thermal fluid heaters. Permit applications will be due 12 months after rule amendment for units that are currently permitted at a NOx emission limit greater than 20 ppm. These thermal fluid heaters will have to meet the proposed 12 ppm NOx limit by January 1, 2022.

> *(2) An owner or operator of a non-RECLAIM facility with any thermal fluid heaters exceeding the limit specified in subparagraph (c)(1)(K) shall:*
>
> *(A) On or before [12 months after date of amendment], submit a complete SCAQMD permit application for each thermal fluid heater that does not currently meet the limit specified in subparagraph (c)(1)(K).*
>
> *(B) On or before January 1, 2022, meet the applicable NOx emission limit in Table 1146-1 for thermal fluid heaters subject to subparagraph (c)(1)(K).*

[8] Periodic Monitoring Guideline. http://www.aqmd.gov/home/permits/title-v/title-v-requirements#pm.

Paragraph (e)(3) provides low fuel usage units operated at facilities transitioning out of RECLAIM until burner replacement, to install a burner meeting the 30 ppm NOx emission level, per subparagraph (c)(1)(A) of Table 1146-1.

Rule 1146 Exemptions (Subdivision (f))

A new subdivision was added to include rule exemptions. In the current rule, the RECLAIM exemption was stated in subdivision (a). For the proposed amended rule, the exemption will be under subdivision (f) as follows:

> *"The provisions of this rule shall not apply to:*
> *(1) boilers used by electric utilities to generate electricity; and*
> *(2) boilers and process heaters with a rated heat input capacity greater than 40 million Btu per hour that are used in petroleum refineries; and*
> *(3) sulfur plant reaction boilers; and*
> *(4) any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category defined in Rule 1100 – Implementation Schedule for NOx Facilities."*

PROPOSED AMENDED RULE 1146.1

Rule 1146.1 Applicability (Subdivision (a))
Rule 1146.1 applies to boilers, steam generators, and process heaters that are greater than 2 million BTUs per hour and less than 5 million BTUs per hour of rated heat input capacity used in any industrial, institutional or commercial operation with the exception of boilers operated at RECLAIM facilities pertaining to NOx emissions only.

The proposed amendments would revise and move the exception that is contained in the applicability to a new subdivision (f) – Exemptions.

Rule 1146.1 Definitions (Subdivision (b))
The following definitions were added to Rule 1146 to distinguish different boiler types, facility types, and consistently define the meaning of modification.

FIRE-TUBE BOILER in paragraph (b)(7), which means:

> *"any BOILER that passes hot gases from a fire box through one or more tubes running through a sealed container of water. The heat of the gases is transferred through the walls of the tubes by thermal conduction, heating the water and ultimately creating steam."*

FORMER RECLAIM FACILITY in paragraph (b)(8), which means:

> *"a facility that was in the Regional Clean Air Incentives Market, as established in Regulation XX, that has received a final determination notification, and is no longer in the RECLAIM program."*

MODIFICATION in paragraph (b)(12), which means:

> *"any physical change that meets the criteria set forth in Rule 1302 – Definitions."*

NON-RECLAIM FACILITY in paragraph (b)(13), which means:

> *"a facility that is not and never was in the Regional Clean Air Incentives Market, as established in Regulation XX."*

RECLAIM FACILITY in paragraph (b)(16), which means:

> *"a facility that is currently in the Regional Clean Air Incentives Market, as established in Regulation XX."*

Rule 1146.1 Requirements (Subdivision (c))
Prior to this amendment, RECLAIM facilities were not required to comply with the command-and-control NOx limits in Rule 1146.1 because of the exemption specified in Rule 2001(j). In order to remove this exemption, subdivision (c) will have the following notwithstanding clause:

> *Notwithstanding the exemptions contained in Table 1 – Existing Rules Not Applicable to RECLAIM Facilities for Requirements Pertaining to NOx Emissions, of subdivision (j) of Rule 2001, the owner or operator of any unit(s) subject to this rule shall not operate the unit in a manner that exceeds the emission limits specified in (c)(1), (c)(2), and (c)(3*).

RECLAIM and former RECLAIM facilities with equipment subject to Rule 1146.1 will be required to comply with the proposed emission limit in paragraph (c)(1) based on the applicable

category in Table 1146.1-1, which represents current BARCT. The implementation schedule will be detailed in PR 1100, as specified in subparagraph (e)(1).

As shown below, the NOx limits in Table 8 which is also in PAR 1146.1 Table 1146.1-1 changed for some categories. Additionally, a new column for rule references of the different categories was added while the column specifying dates for submittal of permit applications was removed.

Table 8
Table 1146.1-1 Compliance Limits

Rule Reference	Category	Limit[1]	Compliance Schedule for NON-RECLAIM Facilities	Compliance Schedule for RECLAIM and FORMER RECLAIM Facilities
(c)(1)(A)	All Other Units	30 ppm or for natural gas fired units 0.036 lbs/10^6 Btu	September 5, 2008	See Rule 1100 – Implementation Schedule for NOx Facilities
(c)(1)(B)	Any Units Fired on Landfill Gas	12 to 20 ppm	January 1, 2022	
(c)(1)(C)	Any Units Fired on Digester Gas	15 ppm	January 1, 2015	
(c)(1)(D)	Atmospheric Units	12 ppm or 0.015 lbs/10^6 Btu	January 1, 2014	
(c)(1)(E)	Any Units Fired on Natural Gas, Excluding Fire-tube Boilers, Atmospheric Units, and Thermal Fluid Heaters	9 ppm or 0.011 lbs/10^6 Btu	See (c)(5)(A)	
(c)(1)(F)	Any Fire-tube Boilers Fired on Natural Gas	7 ppm or 0.0085 lbs/10^6 Btu		
(c)(1)(G)	Thermal Fluid Heaters	12 ppm or 0.015 lbs/10^6 Btu	See (c)(5)(B) for units with an existing NOx limit ≤ 20 ppm See (e)(2) for units with an existing NOx limit >20 ppm	

[1] All parts per million (ppm) emission limits are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes.

Requirements for Low-Fuel Use Units

Paragraph (c)(4), which contains provisions for low fuel usage units that have been in operation prior to September 5, 2008, would also apply to units in a RECLAIM or former RECLAIM facility that have been in operation prior to the proposed amendment with an annual heat input less than or equal 18,000 therms per year. Any owner or operator that complies with the alternative compliance option specified in paragraph (c)(4) is still subject to a NOx emission limit of 12 ppm (or 0.036 lbs/10^6 Btu), pursuant to paragraph (e)(3). On or after January 1, 2015 or until burner replacement has been the compliance schedule specified in paragraph (e)(3) for non-RECLAIM

low-fuel use units. Since this compliance schedule will be retained, the applicable compliance deadline for low-fuel use units in RECLAIM or former RECLAIM facilities will be until burner replacement.

Requirements for Units Permitted at 12 ppm or less of NOx (or Thermal Fluid Heaters Permitted at 20 ppm or less of NOx)

As discussed previously, PAR 1146.1 would allow the same compliance provisions for non-RECLAIM units between 2 and 75 MMBtu/hr meeting the then-applicable BACT limit of 12 ppm as was previously done during the 2008 amendments.

Paragraph (c)(5) will specify the compliance timeframe for units currently permitted to meet a NOx limit of 12 ppm or less and thermal fluid heaters permitted to meet a NOx limit of 20 ppm or less. These units will have to meet the applicable NOx emission limit by 15 years after the proposed amendment or when 50 percent or more of the unit's burners are replaced. The same compliance timeframe will be specified in PR 1100 for units currently permitted to meet a NOx limit of 12 ppm or less and thermal fluid heaters permitted to meet a NOx limit of 20 ppm or less at a RECLAIM or former RECLAIM facility.

(5) An owner or operator of a non-RECLAIM facility that has installed or modified the following units prior to [date of amendment] shall meet the specified NOx emission limit on [15 years after the date of amendment] or when 50 percent or more of the unit's burners are replaced, whichever is earlier:

(A) Natural gas fired units subject to subparagraph (c)(1)(E) or (c)(1)(F) with a NOx emission limit of 12 ppm or less as specified in a SCAQMD Permit to Operate; or

(B) Thermal fluid heaters subject to subparagraph (c)(1)(G) with a NOx emission limit of 20 ppm or less as specified in a SCAQMD Permit to Operate.

Requirements for Biogas Units

Paragraph (c)(7), which applies to biogas units that are co-fired with natural gas, would require compliance with the emission limits in Table 1146.1-1 by each applicable compliance date for the selected unit under Rule 1100 for units located at a RECLAIM or former RECLAIM facility.

Rule 1146.1 Compliance Determination (Subdivision (d))

Subdivision (d) contains the compliance determination requirements for the equipment subject to this rule. Subparagraph (d)(6)(A) specifies the periodic monitoring for NOx emissions that each owner or operator of units subject to paragraphs (c)(1), (c)(2), or (c)(3) must conduct. For units at a RECLAIM or former RECLAIM facility, the NOx emissions checks will be required according to the monitoring schedule for the selected unit under Rule 1100. Subparagraph (d)(6)(B) would require a RECLAIM or former RECLAIM facility to conduct NOx emission checks for low fuel usage units according to the existing tune-up schedule contained in subparagraph (c)(4)(B) during burner replacement.

Rule 1146.1 Compliance Schedule (Subdivision (e))

Subdivision (e) contains the compliance schedule provisions for units at a RECLAIM or former RECLAIM facility and for thermal fluid heaters at a non-RECLAIM facility. Paragraph (e)(1) references the compliance schedule specified in Rule 1100 for RECLAIM or former RECLAIM facilities, since Rule 1100 will contain the implementation schedules for the units that will be transitioning out of the RECLAIM program. Paragraph (e)(2) will specify the compliance schedule for non-RECLAIM thermal fluid heaters. Permit applications will be due 12 months

after rule amendment for units that are currently permitted at a NOx emission limit greater than 20 ppm. These thermal fluid heaters will have to meet the proposed 12 ppm NOx limit by January 1, 2022. Paragraph (e)(3) provides low fuel usage units operated at facilities transitioning out of RECLAIM until burner replacement, to install a burner meeting the 30 ppm NOx emission level, per subparagraph (c)(1)(A) of Table 1146.1-1.

Rule 1146.1 Exemptions (Subdivision (f))

A new subdivision was added to include rule exemptions. In the current rule, the RECLAIM exemption was stated in subdivision (a). For the proposed amended rule, the exemption will be under subdivision (f) as follows:

> *"The provisions of this rule shall not apply to any unit at a RECLAIM or former RECLAIM facility that is subject to a NOx emission limit in a different rule for an industry-specific category defined in Rule 1100 – Implementation Schedule for NOx Facilities."*

PROPOSED AMENDED RULE 1146.2

Rule 1146.2 applies to large water heaters and small boilers and process heaters with a rated heat input capacity up to and including 2 MMBtu/hr. There are both manufacturer and end-user requirements contained in the rule. There were no changes to subdivision (a) Purpose and Applicability, subdivision (d) Certification, subdivision (e) Modification (Retrofit) Provisions and Demonstration of Compliance With Emission Limits subdivision (f) Identification of Compliant Units, subdivision (g) Enforcement, subdivision (i) progress reports. All other revisions to PAR 1146.2 are discussed below.

Rule 1146.2 Definitions (Subdivision (b))

A definition was added for BEST AVAILABLE RETROFIT CONTROL TECHNOLOGY in paragraph (b)(1):

> *"as defined in the California Health and Safety Code Section 40406."*

A definition was added for FORMER RECLAIM FACILITY in paragraph (b)(6):

> *"a facility that was in the Regional Clean Air Incentives Market, as established in Regulation XX, that has received a final determination notification, and is no longer in the RECLAIM program."*

A definition was added for RECLAIM FACILITY in paragraph (b)(15):

> *"a facility that is currently in the Regional Clean Air Incentives Market, as established in Regulation XX."*

Rule 1146.2 Requirements (Subdivision (c))

Paragraphs (c)(3), (c)(4), and (c)(5) contain end-user requirements for the operation of units subject to the rule. As discussed in Chapter 2, staff anticipates to further assess the advancement of control technology and the cost effectiveness of the equipment regulated under Rule 1146.2. To avoid the need to install an intermediate technology that would be obsolete upon future amendment to Rule 1146.2, it is recommended that RECLAIM facilities with Rule 1146.2 equipment can exit RECLAIM, but the compliance date under paragraph (c)(13) is proposed in a later timeframe (December 31, 2023) to allow staff time to conduct a technology assessment. Dependent on the results of the technology assessment, if it is determined that the NOx emission limits specified in Rule 1146.2 still represent BARCT, NOx RECLAIM facilities with Rule 1146.2 units will be required to meet the applicable NOx limits by December 31, 2023. In contrast, if a

more stringent BARCT level is applicable, then a new compliance schedule will be developed through a future rule development.

Rule 1146.2 Exemptions (Subdivision (h))
Subdivision (h) contains the exemptions to the provisions of this rule. Paragraph (h)(3) contains the exemptions for units at any RECLAIM or former RECLAIM facilities that are subject to a NOx emission limit in a different rule for an industry-specific category as defined in Rule 1100 – Implementation Schedule for NOx Facilities.

PROPOSED RULE 1100

Proposed Rule 1100 - Implementation Schedule for NOx Facilities specifies the implementation schedule for NOx RECLAIM and former NOx RECLAIM facilities that have equipment regulated under PARs 1146 and 1146.1. The compliance timeframe for PARs 1146 and 1146.1 was established taking into consideration equipment size range and the number of units at a facility. Also taken into consideration within the compliance schedule are facilities with multiple units subject to multiple source-specific landing rules. Appendix B of this staff report contains the facility and equipment analyses that were conducted to understand the number, size and emissions of the units that would be required to meet the NOx emission limits. The implementation schedule for equipment regulated under PAR 1146.2 is included in that rule.

Rule 1100 Purpose (Subdivision (a))
The purpose of this rule is to establish the implementation schedule for Regulation XX NOx RECLAIM facilities that are transitioning to a command-and-control regulatory structure.

Rule 1100 Applicability (Subdivision (b))
Proposed Rule 1100 applies to RECLAIM and former RECLAIM facilities that own or operate equipment that meets the applicability provisions specified in PARs 1146 and 1146.1. The applicability provisions excludes equipment at energy generating facilities and refineries which will be subject to a NOx emission limit under other industry-specific rules.

Rule 1100 Definitions (Subdivision (c))
Definitions for a Rule 1146 unit and a Rule 1146.1 unit are included in PR 1100 that make reference to the definition of boiler and process heater contained in both Rule 1146 and Rule 1146.1. In addition, a definition for Industry-Specific Category has been specified that would list the types of RECLAIM facilities that would not be subject to the requirements of PR 1100. At this time, refineries and EGFs (except for non-power generating boilers) would not be subject to the command-and-control rules referenced in PR 1100 (Rule 1146 and Rule 1146.1) or the implementation schedule listed in subdivision (d). These types of equipment and all other combustion sources belonging to these two industry-specific categories will be addressed in individual command-and-control rules that will contain both the required emission limits and implementation schedule. Proposed Rule 1100 includes other definitions under subdivision (c) to improve the clarity of the proposed rule.

Rule 1100 Implementation Schedule (Subdivision (d))

Implementation Schedule for Retrofits
Proposed Rule 1100 subdivision (d) establishes the implementation schedule requirements for boilers and process heaters that will be subject to the emission requirements of Rule 1146 and Rule 1146.1. Proposed Rule 1100 requires owner or operators to submit a complete permit application no later than 12 months after rule adoption, which leaves about 18 – 24 months for permit approval,

unit installation and source testing. RECLAIM facilities that do not meet the emission limits of Rule 1146 and Rule 1146.1 would have until 12 months after rule adoption to submit a complete permit application for retrofits or replacements. RECLAIM facilities retrofitting boilers and process heaters would have until January 1, 2021 to meet the applicable Rule 1146 and Rule 1146.1 emission requirements for at least 75% of the total heat input for the boilers and process heaters at the facility. The heat input is the equipment rating of the unit, expressed in million BTUs per hour. The final compliance deadline for the remaining units would be January 1, 2022. Subparagraph (d)(1)(E) will include the rule references of the applicable NOx concentration limits specified in subparagraphs (d)(1)(B) and (d)(1)(C). This implementation schedule will be specified in paragraph (d)(1) as follows:

> *"An owner or operator of a RECLAIM or former RECLAIM facility with any Rule 1146 or Rule 1146.1 Unit shall:*
>
> *(A) On or before [12 months after date of adoption], submit complete permit applications for any Rule 1146 and Rule 1146.1 Units that currently do not meet the applicable NOx concentration limit specified in subparagraph (d)(1)(E);*
>
> *(B) On or before January 1, 2021 meet the applicable NOx concentration limit for a minimum of 75% of the total heat input for all Rule 1146 and Rule 1146.1 Units at the facility; and*
>
> *(C) On or before January 1, 2022 meet the applicable NOx concentration limit of 100% of Rule 1146 and Rule 1146.1 Units at the facility."*

When establishing the compliance schedule for PARs 1146 and 1146.1 for equipment at RECLAIM facilities, the compliance schedule of the 2008 amendment of Rules 1146 and 1146.1 was considered. In the 2008 amendments, there were about 2,100 active permitted units affected by the rule amendments. The impacted facilities were given about 3 - 5 years to comply with the then-proposed emission limits. Given the considerably lower number of units that would need to be retrofitted or replaced under the proposed amendments (127 permitted units for Rule 1146 and 19 permitted units for Rule 1146.1), therefore a similar, if not a shorter timeframe would be reasonable. The compliance timeframe for PARs 1146 and 1146.1 also took into consideration equipment size range, the number of units at a facility, and facilities with multiple units subject to multiple source-specific landing rules. The details of the analysis are provided in Appendix B of this staff report. Proposed Rule 1100 would require a compliance timeframe of 2 to 3 years. To focus on larger emission sources having an earlier final implementation date, staff proposed to stagger the implementation schedule by rated heat input, an approach that is consistent with the 2008 amendment of Rule 1146 and Rule 1146.1. About 17% of the affected facilities have multiple units with rated heat input in different size bins. Instead of setting a different compliance schedule for each size category, all Rule 1146 and 1146.1 equipment are grouped together providing more flexibility to operators to achieve the greatest emission reductions first.

Implementation Schedule for Replacement Equipment

An owner or operator that elects to fully replace the affected equipment, in lieu of installing ultra-low NOx burners or SCRs is given until January 1, 2023 to comply with the existing NOx emission limits in Rules 1146 and 1146.1, provided the facility notifies the Executive Officer (including Facility Name, Facility Identification Number, Permit Number for the unit(s) being replaced; size of the existing and new units (MMBtu/hr), and fuel type) within 12 months after the date of rule adoption :

> *"An owner or operator of a RECLAIM or former RECLAIM facility that elects to replace an existing Rule 1146 or Rule 1146.1 Unit with a new unit may use this replacement unit*

to meet the total heat input percentage requirement specified under subparagraphs (d)(1)(B) and (d)(1)(C) provided the owner or operator:

(i) On or before [12 months after date of adoption], submits complete permit applications for any new Rule 1146 and Rule 1146.1 Units, as well as accepts a permit condition that identifies which unit(s) will be replaced and no longer operated once the new units are installed;and

(ii) Replaces the existing unit on or before January 1, 2023."

Requirements for Units Permitted at 12 ppm or less of NOx (or Thermal Fluid Heaters Permitted at 20 ppm or less of NOx)

PARs 1146 and 1146.1 will include a provision for a compliance timeframe similar to the provision included during the 2008 amendments of Rule 1146 and 1146.1, for units that complied with the then-applicable BACT limit of 12 ppm and were installed prior to the 2008 amendments. Paragraph (d)(2) of PR 1100 will specify the compliance timeframe for units greater than 75 MMBtu/hr that are currently permitted to meet a NOx limit of 7 ppm or less, units between 2 and 75 MMBtu/hr that are currently permitted to meet a NOx limit of 12 ppm or less, and thermal fluid heaters permitted to meet a NOx limit of 20 ppm or less. These units will have to meet the applicable NOx emission limit 15 years after the date of the proposed rule amendment or when 50 percent or more of the unit's burners are replaced.

Exclusion for Facilities in an Industry-Specific Category

Paragraph (d)(3) states that any unit at a RECLAIM facility that is subject to an industry-specific rule as defined in subdivision (c) would not be subject to the command-and-control rules referenced in subdivision (d) or the implementation schedule listed in subdivision (d).

Rule 1100 Applicable Monitoring, Reporting, and Recordkeeping (Subdivision (e))

Monitoring, Reporting, and Recordkeeping for Title V Facilities

Under the Title V program, "relaxation of any monitoring, recordkeeping, or reporting requirement, term, or condition in the Title V permit" is considered a significant revision (Rule 3000(b)(31)), and would trigger a public process (Rule 3005(f) and Rule 3006(a)). To avoid the need for an extensive public process triggered by the change in the MRR requirements, PR 1100 would require Title V facilities to maintain the RECLAIM MRR requirements as part of the proposed rule amendments. In other words, Title V facilities would still be subject to the MRR requirements in RECLAIM after the transition. Staff is committed to work on the MRR requirements for Title V facilities in the RECLAIM program, and address the transition for Title V facilities as soon as practicable. Paragraph (e)(1) states that RECLAIM or former RECLAIM facilities that are also in Title V would be required to comply with the monitoring, reporting, and recordkeeping requirements specified in Rule 2012. Additional information on MRR analysis can be found in Appendix A.

Monitoring, Reporting, and Recordkeeping for Non-Title V Facilities

Proposed Rule 1100 proposes that both major RECLAIM and non-major RECLAIM sources in non-Title V facilities to be subject to the MRR requirements in Rule 1146 series. Paragraph (e)(2) states that the monitoring, reporting, and recordkeeping requirements in the applicable rule(s) as specified in subdivision (b) shall automatically apply for a non-Title V RECLAIM facility once it becomes a former RECLAIM facility. Additional information on MRR analysis can be found in Appendix A.

TRANSITION LOGISTICS

The proposed amendments would initiate the transition of RECLAIM facilities into a command-and-control regulatory structure. A facility is ready to transition into command-and-control if all the NOx emitting equipment located at the RECLAIM facility is subject to a non-RECLAIM rule that regulates NOx emissions and does not specify an exemption for RECLAIM facility emissions. Command-and-control rules that exempt RECLAIM facilities will undergo amendments throughout the transition process to include RECLAIM facilities. Once the applicable rules at a RECLAIM facility have been adopted and/or amended a facility would be eligible exit.

The procedure for the transition can be found in Rules 2001 and 2002. Rule 2001 specifies the eligibility criteria for a facility to exit RECLAIM. Rule 2002 contains the notification procedures for facilities that will be transitioned out of RECLAIM and addresses the RTC holdings for these facilities that will be transitioned out of RECLAIM or that elect to exit RECLAIM. Rule 2002 Paragraphs (f)(6) through (f)(9), detail how a facility will be notified regarding the transition.

Rule 2001 Paragraph (g)(2) would specify actions for submitting the request to opt-out of the NOx RECLAIM program:

> *"The owner or operator of a RECLAIM facility that is eligible to exit the NOx RECLAIM program, pursuant to the requirements of paragraph (g)(1), may notify the Executive Officer with a request to opt-out that includes the identification of:*
>
> > *(A) All permitted and unpermitted NOx RECLAIM emission equipment, including applicable control equipment; and*
> >
> > *(B) Permitted NOx emission levels, and if not available, manufacturer guaranteed NOx emission levels."*

Upon review of the submitted information, the Executive Officer would notify the facility that the facility meets the criteria to transition out of RECLAIM and would issue an initial determination notification to initiate the facility's transition to command-and control. A facility would then be subject to the provisions in PAR 2002 (f)(6) through (f)(10), but not be required to resubmit any equipment information required by subparagraphs (f)(6)(A) and (f)(6)(B) because the Executive Officer would have already obtained the facility's equipment information through the opt-out process prior to issuing the initial determination notification. If the Executive Officer denies the request to transition out of NOx RECLAIM, however, the facility would remain in the RECLAIM program. The reasons for a denial would be that the facility does not meet all the requirements in proposed paragraph (g)(1). If an applicable non-RECLAIM rule has not yet been amended, the facility would not be allowed to exit. Also, if it is determined that a piece of equipment that emits non-combustion NOx and has no applicable rule for its NOx emissions, the facility would not be allowed to exit. The facility would be notified if the request to opt-out is denied. These approval and denial provisions are contained in subparagraph (g)(3), which states:

If the owner or operator of a RECLAIM facility meets the criteria for exiting the NOx RECLAIM program, specified in paragraph (g)(1) and has satisfied the requirements of paragraph (g)(2), the Executive Officer will issue an initial determination notification and the facility shall be subject to the provisions of Rule 2002, paragraphs (f)(6) through (f)(10), excluding the requirements in subparagraphs (f)(6)(A) and (f)(6)(B). If the request to opt-out is denied, the facility shall remain in RECLAIM, and the owner or operator will be notified.

Rule 2002 Paragraph (f)(10) outlines requirements pertaining to RTCs for facilities that are notified for exiting RECLAIM. It states that:

"The owner or operator of any RECLAIM facility that receives a final determination notification from the Executive Officer pursuant to paragraph (f)(8):

(A) Shall not sell or transfer any future compliance year RTCs as of the date specified in the final determination notification and may only sell or transfer that current compliance year's RTCs until the facility is transitioned out of the RECLAIM program; and

(B) Shall provide Emission Reduction Credits to offset any emissions increases, calculated pursuant to Rule 1306 – Emission Calculations, notwithstanding the exemptions contained in Rule 1304 – Exemptions, until New Source Review provisions governing emission calculations and offsets for former RECLAIM sources are amended after (date of amendment)."

If, after review, a RECLAIM facility receives a final determination notification, then the facility would not be able to sell any future compliance year RTCs after a date certain as specified in the notification, but could only sell that current compliance year RTCs until the facility exits RECLAIM. Additionally, any RECLAIM facility that exits the NOx RECLAIM program will not have access to the SCAQMD internal offset bank until new provision governing emission calculations and offset requirements for former RECLAIM facilities are adopted in Regulation XIII. This temporary provision would require all former RECLAIM facilities to provide emission reduction credits (ERCs) to offset any emission increases for new or modified sources even if the facility has a PTE of less than 4 tons per year and would have been eligible for emission offsets from the SCAQMD internal bank if the source was not RECLAIM.

Currently, facilities regulated under the command-and-control regulatory structure are subject to Regulation XIII for New Source Review (NSR) requirements. There are a number of NSR policy issues that need to be resolved as facilities transition to a command-and-control regulatory structure. Staff has been working on these issues with the RECLAIM Working Group. In addition, staff will continue discussions with EPA on NSR issues. One of the most important NSR issues is the future availability of NOx ERCs in the open market and the concern that there is not a sufficient supply of ERCs in the open market for facilities that want to install new or modified equipment that triggers NSR. RECLAIM facilities that are comprised of the region's largest emitters would join an existing open market with a limited amount of ERCs. Until the NSR concerns are resolved, facilities will be allowed to remain in RECLAIM for a limited time upon receiving an initial determination notification. However, facilities would still be subject to non-RECLAIM rules and their associated BARCT implementation schedules that been adopted or amended to include RECLAIM facilities. Rule 2002 paragraph (f)(11) allows facilities to request to remain in RECLAIM:

"An owner of operator of a RECLAIM facility that receives an initial determination notification may elect for the facility to remain in RECLAIM if a request to the Executive Officer to remain in RECLAIM is submitted, including any equipment information required pursuant to paragraph (f)(6).

(A) Upon written approval by the Executive Officer that the facility shall remain in RECLAIM:

(i) The facility may remain in RECLAIM until a subsequent notification is issued to the facility that it must exit by a date no later than December 31, 2023.

(ii) The facility is required to submit any updated information within 30 days of the date of the subsequent notification.

(iii) The facility shall comply with all requirements of any non-RECLAIM rule that does not exempt NOx emissions from RECLAIM facilities."

As a result of the proposed amendments to Rules 1146, 1146.1 and 1146.2, staff has identified 26 RECLAIM facilities that could potentially be transitioned out of the RECLAIM program. These facilities have permitted NOx emissions solely from a combination of (i) Rule 1146, (ii) Rule 1146.1, and (iii) Rule 1146.2. After PARs 1146, 1146.1, and 1146.2 are amended to remove the exemption for RECLAIM facilities, the identified facilities will be ready to fully transition from the cap-and-trade regulatory approach to a command-and-control regime.

CHAPTER 4: IMPACT ASSESSMENT

INTRODUCTION

Among the 103 RECLAIM facilities that will be affected by the proposed amendments, 10 facilities already met BARCT requirements and will only be subject to change to monitoring recordkeeping and reporting. A total of 66 facilities would be required to retrofit the non-compliant units by the compliance dates specified in PR 1100**,** while 37 facilities operating units that comply with the applicable RECLAIM BARCT limit of 12 ppm would not apply until the unit's burner replacement. The permitted Rule 1146/1146.1/1146.2 units in the facilities that meet BARCT, but could be impacted by the changes in MRR requirements as they transition from the RECLAIM program into a command-and-control regulatory structure. The proposed rule amendments are estimated to reduce 0.27 tons per day (tpd) of NOx from RECLAIM facilities by January 1, 2023, and 0.07 tpd of NOx reduction for non-RECLAIM landfill facilities by January 1, 2022. The proposed amendments affect a wide variety of RECLAIM and non-RECLAIM facilities. Staff has estimated that there are about 291 active permitted units in the RECLAIM universe that are affected by this rule amendment (219, 40 and 32 permitted units affected by PAR 1146, 1146.1 and 1146.2 respectively). Among the 291 units impacted, 149 units would be required to comply with the existing BARCT limits in Rule 1146 series (127 permitted units for Rule 1146, 19 permitted units for Rule 1146.1, and 3 permitted units for Rule 1146.2) by the compliance dates as specified in PR 1100, 142 units would be allowed to meet the emission limits upon burner replacement, and units that are already at BARCT would be subject to the change in MRR requirements upon transition.

EMISSION REDUCTIONS

The total NOx inventory for the RECLAIM units affected by PARs 1146 series is estimated to be 0.42 tons per day. This estimate is taken from SCAQMD annual emission report (AER) inventory database for compliance year 2016 for permitted units, and excludes EGFs and refineries. The District's AER program was developed to track emissions of air contaminants from permitted facilities. Facilities with annual emissions exceeding 4 or more tons of nitrogen oxides (NOx), sulfur oxides (SOx), volatile organic compounds (VOCs), specific organics (SPOG), particulate matter (PM), or emissions of 100 tons per year or more of carbon monoxide (CO) are required by the District to submit an annual emissions report. Facilities could also be required to submit AER if the facility receives a notification from SCAQMD or subject to the AB2588 Program for reporting quadrennial updates to its toxics inventory. For each piece of RECLAIM equipment, the annual activity is estimated using the facilities fuel usage as reported in the AER reports for year 2016. Emission factor is represented by the permit limit specific for each unit. Emissions for RECLAIM units identified as major sources, as defined in SCAQMD Rule 2012, are constantly monitored with CEMS, so the units may not be assigned a permit limit for emissions reporting. Emission factors for RECLAIM major sources can be back-calculated using CEMS reporting data and reported fuel for the corresponding year. Annual emissions for major sources were calculated from facility submitted AER usage and emission factor derived from CEMS back-calculations or permit limit. For units with missing data or reports, their emissions were calculated assuming 50% operating capacity. The NOx emission distribution by the size range are as follows:

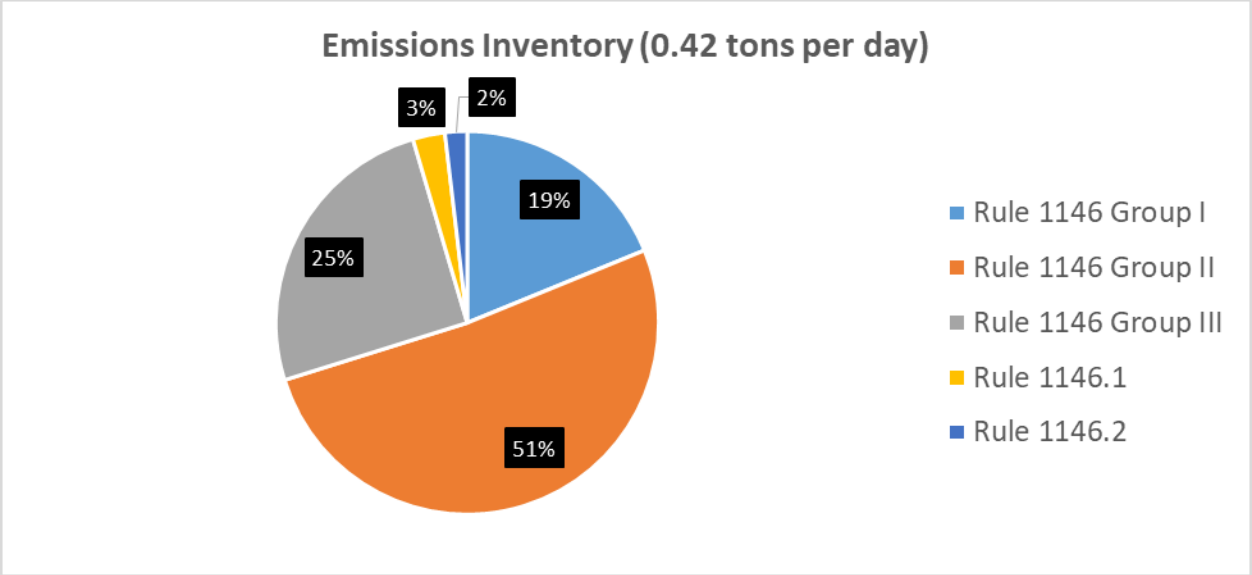


Figure 3
2016 RECLAIM Baseline Emissions by Size Range

As presented in Figure 3, about half of the 2016 baseline emissions were emitted from Rule 1146 Group II units (20 to <75 MMBtu/hr). On average, each Group II unit accounted for 0.0027 tpd of NOx emissions. Although Group I units contributed to 19% of baseline emissions, on average, each Rule 1146 Group I unit accounted for more than quadruple the amount of emissions (0.011 tpd) than a Group II unit (0.0027 tpd). This suggests that to achieve the greatest amount of emission reduction early, equipment with a larger heat input should be addressed first.

Emission reductions were calculated using the difference between the emission factor for the existing permit emission limits and the NOx emission limits for the various categories of boilers and heaters presented in the staff proposal. Based on this methodology, the proposed rule amendments are estimated to reduce approximately 0.27 tons per day of NOx emissions from RECLAIM facilities regulated under PARs 1146 series. The estimated emission reductions by unit size range are presented in Figure 4.

Note that the emissions for Rule 1146.2 were calculated based on the 32 permitted units. As discussed in Appendix B, the majority of Rule 1146.2 units are exempt from permitting. Therefore, the actual emission inventory, and the associated emission reductions of PAR 1146.2 could be considerably higher than the ones presented in Figures 3 and 4. To avoid overestimating the emission reductions from PAR 1146.2, only emissions from the permitted units were included in the analysis.

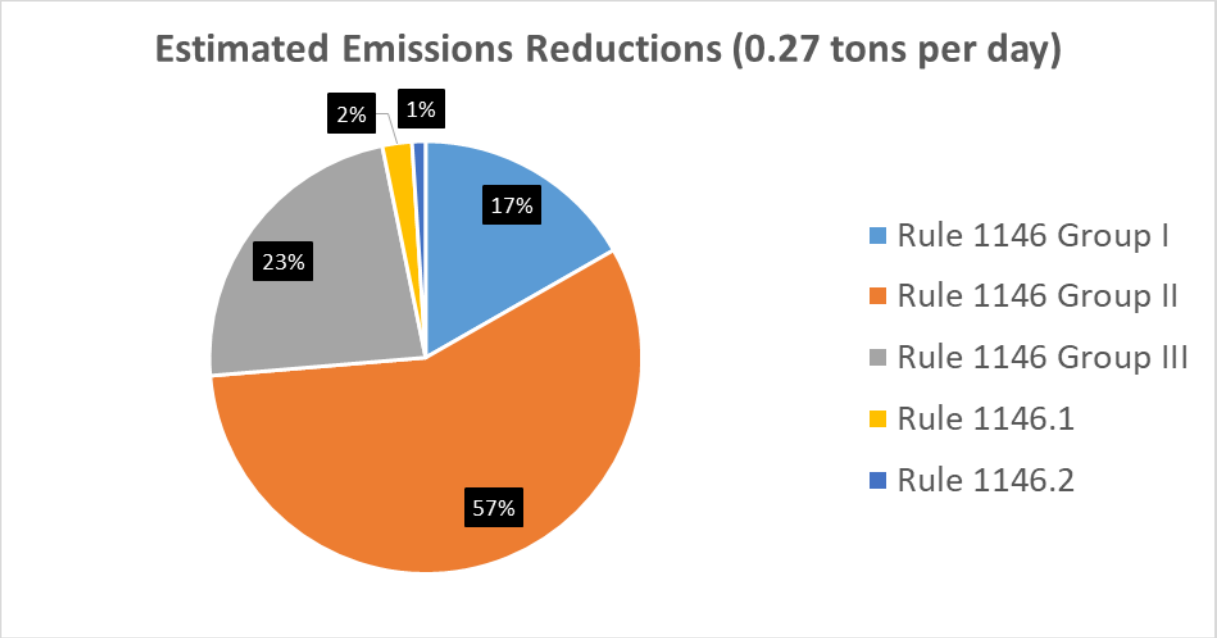


Figure 4
RECLAIM Emission Reduction by Size Range

Total emissions inventory for non-RECLAIM units affected by PAR 1146 series is estimated to be about 0.66 tpd. Distributions of estimated emission inventory and emission reduction by equipment category are displayed in Figures 5 and 6 respectively. Estimates for baseline emissions and emission reductions of units within the non-RECLAIM universe are calculated using unit distribution figures from 2008 amendments of Rule 1146 and Rule 1146.1, thermal fluid heaters are not included in calculation estimates. Proposed rule changes will limit fire-tube units classified under Rule 1146 Group II, Rule 1146 Group III, and Rule 1146.1 to 7 ppm while maintaining the current limit of 9 ppm for non fire-tube units, and limits for thermal fluid heaters will be lowered to 12 ppm from the current 30 ppm limit. Emission limit for Rule 1146 Group I units will be unchanged at the current 5 ppm limit. Emission limit for digester gas fired equipment will also be unchanged at the current 15 ppm limit. Limit for landfill gas fired units will be lowered to between 12 to 20 ppm. Baseline emissions were calculated with assumptions that unit composition of the universe is the same as that at the time of the 2008 evaluation and minimum of 80% of units evaluated in 2008 are still in operation. Calculations for emission reductions also assumed that the fraction of fire-tube units in non-RECLAIM universe is the same as those in the RECLAIM universe, where 40% of Rule 1146 Group II, Rule 1146 Group III and Rule 1146.1 units were fire-tube units that will be subject to proposed limits of 7 ppm. Reductions for landfill gas fired units were estimated using a conservative approach by assuming that the proposed BARCT is at 20 ppm. Emission reduction numbers might change depending on final staff recommendation. Emission reductions for non-RECLAIM natural gas fired units are effective 15 years after date of rule amendment. Emission reductions from landfill gas fired units are effective by January 1, 2022. Thermal fluid heaters were not included in this calculation since units could not be identified due to the lack of distinction in their permits that sets the units apart from other process heaters. Thermal fluid heaters make up for a very small portion of the RECLAIM universe (<4%) and are assumed to be nominal in the non-RECLAIM universe.

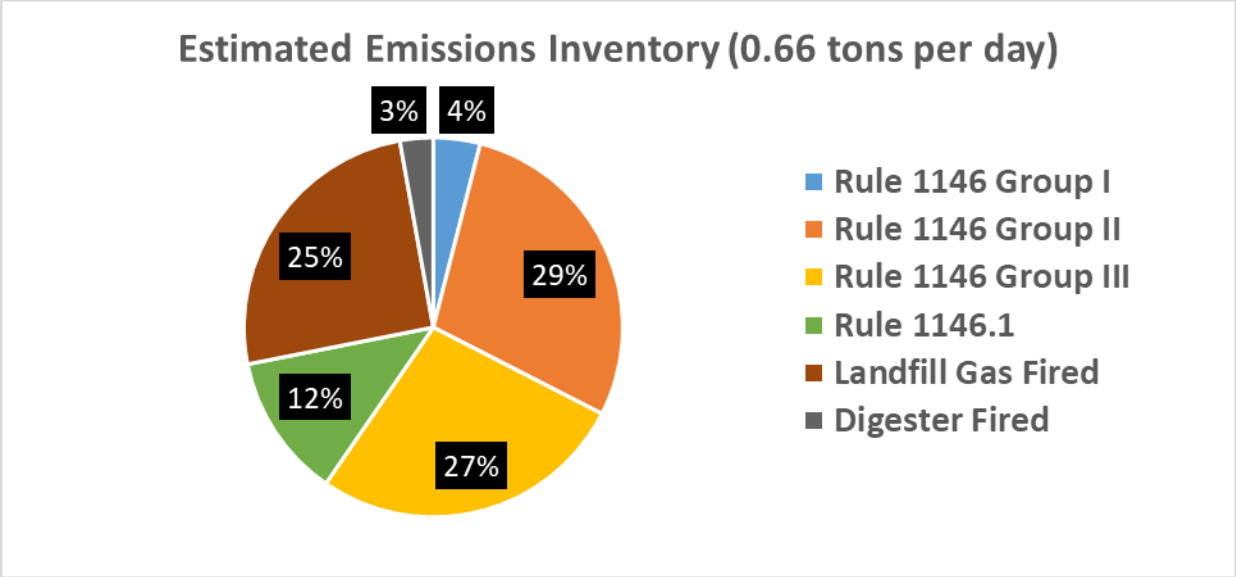


Figure 5
Estimated Non-RECLAIM Emission Inventory by Size Range

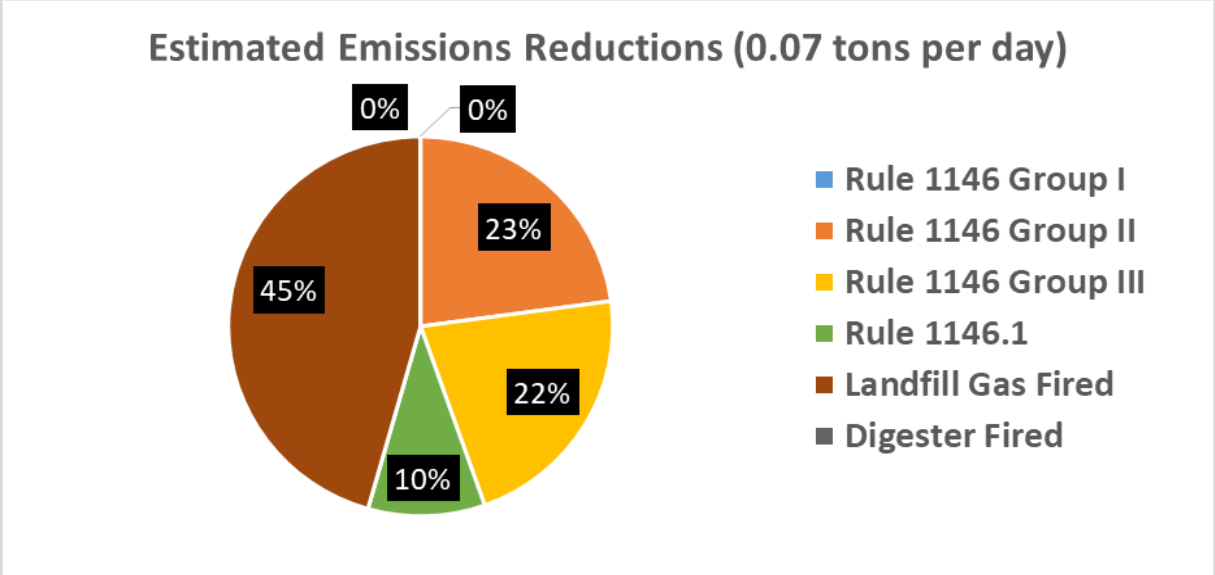


Figure 6
Estimated Non-RECLAIM Emission Reduction by Size Range

SOCIOECONOMIC ASSESSMENT

A socioeconomic assessment for PARs 1146 Series and PR 1100 will be conducted and will be available to the public at least 30 days prior to the SCAQMD Governing Board Meeting anticipated for December 7, 2018.

CALIFORNIA ENVIRONMENTAL QUALITY ACT ANALYSIS

PARs 1146 series and PR 1100 are considered a "project" as defined by the California Environmental Quality Act (CEQA), and the SCAQMD is the designated lead agency. Pursuant to CEQA and SCAQMD's Certified Regulatory Program (Rule 110), the SCAQMD, as lead agency for the proposed project, prepared a Draft Subsequent Environmental Assessment (SEA) for PARs 1146 series and PR 1100 which was released for a 45-day public review and comment period from April 3, 2018 to May 8, 2018. Subsequent to the release of the Draft SEA for public review, changes were made to the project description and the environmental analysis. For this reason, the SCAQMD will be revising and recirculating the Draft SEA for an additional 45-day public review and comment period, for which a separate notice will be provided. As with the Draft SEA, the analysis in the Revised Draft SEA will also indicate that while reducing NOx emissions is an environmental benefit, secondary significant adverse environmental impacts are also expected for the topic areas of air quality and hazards and hazardous materials. The proposed project may have statewide, regional, or area-wide significance; therefore, a CEQA scoping meeting was required (pursuant to Public Resources Code section 21083.9(a)(2)) and held at the SCAQMD's Headquarters in conjunction with a prior Public Workshop on February 14, 2018. The Revised Draft SEA, upon its release, will contain responses to the comments made at the CEQA Scoping Meeting and comment letters received relative to the original Draft SEA.

Responses to comments will also be prepared for any comment letters that are received relative to the Revised Draft SEA, upon its release. Subsequent to the public review and comment period, the Revised Draft SEA will be updated to reflect any modifications that are made to the proposed project and the Revised Draft SEA will be converted to a Final SEA. All of the comment letters and the individual responses to the comments will be included in an appendix to the Final SEA. The Final SEA will be included as an attachment to the Governing Board package. The SCAQMD Governing Board must review the adequacy of the Final SEA, including responses to comments, prior to certification of the Final SEA and adoption of PARs 1146 series and PR 1100.

DRAFT FINDINGS UNDER CALIFORNIA HEALTH AND SAFETY CODE SECTION 40727

Requirements to Make Findings

California Health and Safety Code Section 40727 requires that prior to adopting, amending or repealing a rule or regulation, the SCAQMD Governing Board shall make findings of necessity, authority, clarity, consistency, non-duplication, and reference based on relevant information presented at the public hearing and in the staff report.

Necessity

PARs 1146, 1146.1 and 1146.2, and PR 1100 are needed to establish BARCT requirements for facilities that will be transitioning from RECLAIM to a command-and-control regulatory structure.

Authority

The SCAQMD obtains its authority to adopt, amend, or repeal rules and regulations pursuant to California Health and Safety Code Sections 39002, 39616, 40000, 40001, 40440, 40702, 40725 through 40728, and 41508.

Clarity

PARs 1146, 1146.1 and 1146.2, and PR 1100 are written or displayed so that their meaning can be easily understood by the persons directly affected by them.

Consistency

PARs 1146, 1146.1 and 1146.2, and PR 1100 are in harmony with and not in conflict with or contradictory to, existing statutes, court decisions or state or federal regulations.

Non-Duplication

PARs 1146, 1146.1 and 1146.2, and PR 1100 will not impose the same requirements as any existing state or federal regulations. The proposed amended rules are necessary and proper to execute the powers and duties granted to, and imposed upon, the SCAQMD.

Reference

In amending these rules, the following statutes which the SCAQMD hereby implements, interprets or makes specific are referenced: Health and Safety Code sections 39002, 40001, 40702, 40440(a), and 40725 through 40728.5.

Incremental Cost-effectiveness

H&SC Section 40727.2 requires an incremental cost effectiveness analysis of the proposed rule requirements. The incremental cost effectiveness analysis will be conducted and released in the draft staff report at least 30 days prior to the SCAQMD Governing Board Hearing on PAR 1146 series and PR 1100, which is anticipated to be heard on December 7, 2018.

COMPARATIVE ANALYSIS

Under H&SC Section 40727.2, the SCAQMD is required to perform a comparative written analysis when adopting, amending, or repealing a rule or regulation. The comparative analysis is relative to existing federal requirements, existing or proposed SCAQMD rules and air pollution control requirements and guidelines which are applicable to industrial, institutional, and commercial water heaters, boilers, steam generators, and process heaters. See Table 9 below.

Table 9
Comparative Analysis

Rule Element	PAR 1146	PAR 1146.1	PAR 1146.2	PR 1100	RECLAIM	Equivalent Federal Regulation
Applicability	Boilers, steam generators, and process heaters with maximum rated heat input capacities greater than or equal to 5 MMBtu/hr	Boilers, steam generators, and process heaters with maximum rated heat input capacities greater than 2 MMBtu/hr and less than 5 MMBtu/hr	Large water heaters, boilers and process heaters less than or equal to 2 MMBtu/hr	RECLAIM or post-RECLAIM facilities	Facilities regulated under the NOx RECLAIM program (SCAQMD Reg. XX)	None
Requirements* *All parts per million (ppm) emission limits are referenced at 3 percent volume stack gas oxygen on a dry basis averaged over a period of 15 consecutive minutes.	NOx limits: • Digester gas: 15 ppmv • Landfill gas: 12 to 20 ppmv • Natural gas: 5 ppmv for ≥75 MMBtu/hr, 7 or 9 ppmv for 20–75, 12 ppm for atmospheric, and 12 ppm for thermal fluid heaters For other types of fuels: 30 ppmv other gaseous fuels; 40 ppmv for nongaseous fuels CO limit: 400ppmv	• Digester gas: 15 ppmv • Landfill gas: 12 to 20 ppmv • Natural gas: 7 or 9 ppmv, 12 ppm for atmospheric, and 12 ppm for thermal fluid heaters • All others: 30 ppmv CO limit: 400 ppmv.	NOx limit is 20 ppmv for new units less than 2 MMBtu/hr. NOx limit is 30 ppmv for retrofit units less than 2 MMBtu/hr.	• Schedule for meeting BARCT emission limits and MRR requirements	For refinery gas: 2 ppmv for units > 40 MMBtu/hr For other units: 9 ppmv for units > 20 MMBtu/hr; and 12 ppmv for units ≥ 2 MMBtu/hr	None
Reporting	Every 6 months for units greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200 x 10^9 Btu per year (Rule 218)	None	None	As specified in SCAQMD Rules 1146, 1146.1 and 1146.2	• Daily electronic reporting for major sources • Monthly to quarterly reporting for large sources and process units • Quarterly Certification of Emissions Report and Annual Permit Emissions Program for all units	None
Monitoring	• A continuous in-stack NOx monitor for units greater than or equal to 40 MMBtu/hr and an annual heat input greater than 200 x 10^9 Btu per year • Source testing once every 3 – 5 years for other units	• Source testing once every 5 years	None	As specified in SCAQMD Rules 1146, 1146.1 and 1146.2	• A continuous in-stack NOx monitor for major sources • Source testing once every 3 years for large sources •Source testing once every 5 years for process units	None
Recordkeeping	• Source test records • Maintenance & emission records = 2 years • Monitoring data = 2 years (5 years if Title V)	• Source test records = 2 years (5 years if Title V) • Monitoring data = 2 years (5 years if Title V)	None	As specified in SCAQMD Rules 1146, 1146.1 and 1146.2	• < 15-min. data = min. 48 hours; • ≥ 15-min. data = 3 years (5 years if Title V) • Maintenance & emission records, source test reports, RATA reports, audit reports and fuel meter calibration records for Annual Permit Emissions Program = 3 years (5 years if Title V)	None

APPENDIX A – ANALYSIS OF MRR REQUIREMENTS

INTRODUCTION

Under RECLAIM mass emissions reported by each facility are used to track and demonstrate compliance. To ensure the integrity of reported emissions, RECLAIM includes substantial monitoring and reporting requirements, as specified in Rule 2012 *Requirements for Monitoring, Reporting and Recordkeeping for Oxides of Nitrogen Emissions.* RECLAIM MRR requirements are developed to accurately determine mass emissions of NOx for each facility, which is necessary for emission reconciliation and compliance demonstration in the cap-and-trade regulatory structure. RECLAIM MRR requirements are segregated by device classifications. The 4 major device classifications are major sources, large sources, process units, and Rule 219 exempt equipment.

In a command-and-control regulatory structure, a device-level emission standard (expressed in concentration such as ppm in Rules 1146, 1146.1 and 1146.2) is used for regulatory and compliance demonstration. Staff has analyzed the MRR requirements in RECLAIM and Rule 1146 Series. Comparisons between the MRR requirements in RECLAIM and Rule 1146 Series of (a) source testing, (b) tune up / emission checks, (c) reporting, (d), recordkeeping, and (e) missing data procedures are presented in Tables A1-5, respectively.

Table A-1
Source Testing Requirements

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	**Rule 1146 Series**		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	Continuous Emissions Monitoring System (CEMS) – Annual (or semi-annual#) certification of Relative Accuracy Test Audits (RATA) including source testing	
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr	Source testing once every 3 years;	Source testing once every 3 years for ≥10 and <40 MMBtu/hr; Source testing once every 5 years for ≥5 and <10 MMBtu/hr
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr	Source testing once every 5 years for devices with concentration limit	Source testing once every 5 years;
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr	Not applicable^	Not applicable

* Refer to Rule 2012 for specific definitions
# Only applicable to RECLAIM facilities with standards exceeding the 7.5% requirements
^ Unless equipment is reported to be using an alternate emission factor

Table A-2
Tune Up / Emission Check Requirements

Equipment Type		RECLAIM Tune Up Frequency	Rule 1146 Series Diagnostic Emission Check Frequency
RECLAIM	**Rule 1146 Series**		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	Daily calibration and semi-annual tune ups OR Annual RATA	Not required for units with CEMS
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr	Semi-annual tune ups	At least monthly or every 750 operating hours, or quarterly or every 2000 operating hours
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr	Annual tune ups	At least quarterly or every 2000 operating hours or semi-annually or every 4000 operating hours
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr	Not applicable	Not applicable

* Refer to Rule 2012 for specific definitions

Table A-3
Reporting Requirements

Equipment Type		RECLAIM		Rule 1146 Series
RECLAIM	**Rule 1146 Series**	**Electronic**	**Paper**	
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	Daily automatic reporting	Quarterly Certification of Emissions Report and Annual Permit Emissions Program	Every 6 months (Rule 218)
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr	Monthly reporting		None
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr	Quarterly reporting		None
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr	Quarterly reporting		None

* Refer to Rule 2012 for specific definitions

Table A-4
Recordkeeping Requirements

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	**Rule 1146 Series**		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	• < 15-min. data = min. 48 hours • ≥ 15-min. data = 3 years (5 years if Title V) • Maintenance & emission records, source test reports, RATA reports, audit reports and fuel meter calibration records for Annual Permit Emissions Program = 3 years (5 years if Title V)	• Source test records • Maintenance & emission records = 2 years • Monitoring data = 2 years (5 years if Title V)
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr		• Source test records • Monitoring data = 2 years (5 years if Title V)
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr		• Source test records = 2 years (5 years if Title V) • Monitoring data = 2 years (5 years if Title V)
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr	• Fuel usage records	• Fuel usage records

* Refer to Rule 2012 for specific definitions

Table A-5
Missing Data Procedures

Equipment Type		RECLAIM	Rule 1146 Series
RECLAIM	Rule 1146 Series		
Major Source* • ≥40 MMBtu/hr or • >10tpy	R1146 • ≥40 MMBtu/hr	For >95% availability (short gaps) • use avg. valid hour before and after or use highest hourly NOx conc. for last 30 days For <95% availability (longer gaps) • use highest hourly NOx conc. or last 30 days, or 365 days For <90% availability • use lifetime highest hourly NOx conc.	Not applicable
Large Source* • ≥10 and <40 MMBtu/hr or • >4 and <10 tpy	R1146 • ≥5 and <40 MMBtu/hr	If missing data is < 1 month • use average monthly for the previous 12 months. If missing data is > 1 month • use highest monthly fuel usage for the previous 12 months. If missing data is > 2 months or no records are available • assume 24 hours operation at maximum rated capacity at an uncontrolled emission factor	Not applicable
Process Unit* • >2 and <10 MMBtu/hr • ≤2 MMBtu/hr if permitted	R1146.1 • >2 and <5 MMBtu/hr	If missing data is < 1 quarter • use average quarterly fuel usage for the previous 4 quarters. If missing data is > 1 quarter • use source's highest quarterly fuel usage for the previous 4 quarters. If no records are available • assume 24 hours operation at maximum rated capacity at an uncontrolled emission factor	Not applicable
R219 Exempt • ≤2 MMBtu/hr	R1146.2 • ≤2 MMBtu/hr		

APPENDIX B – FACILITY AND EQUIPMENT ANALYSIS

INTRODUCTION

Starting March 2017, a monthly RECLAIM Working Group Meeting has been held to present and solicit information and suggestions from the public regarding the RECLAIM transition mechanisms. With the consideration of comments received, staff identified four different pathways to transition facilities out of RECLAIM:

- Source-specific command-and-control rules
- Industry-specific command-and-control rules
- Compliance plans
- Opt-out provisions

As of April 2018, four industry-specific categories have been identified. These four sectors are:

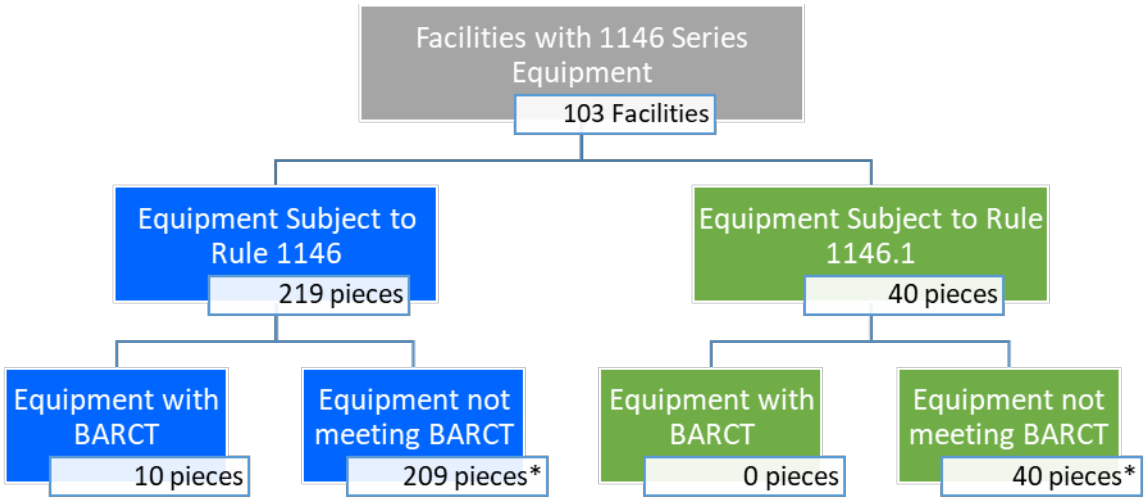
- Electricity Generating Facilities (EGFs)
- Refineries
- Metal Operations Facilities
- Aggregate Facilities

Facilities in these four sectors would be subject to industry-specific command-and-control rules (Rule 1135 for EGFs; Rule 1109.1 for refineries; Rule 1147.1 for metal operations facilities; and Rule 1147.2 for aggregate facilities). Energy generating equipment located in EGFs and equipment located in refineries are subject to requirements to be established in the industry-specific rules. Since they would not follow the implementation schedule established for PARs 1146 series, they are not included in the permit analysis presented in this staff report. However, for metal operations and aggregate facilities as well as EGF equipment that do not generate electricity, their Rule 1146 series equipment will be subject to the requirements and implementation schedule as specified in the proposed rule amendments.

To understand the number and the size of units that need to meet the NOx concentration limits, permit data was retrieved in August 2017 for all Rule 1146, 1146.1, and 1146.2 units in RECLAIM to evaluate facilities with multiple pieces of Rule 1146 and 1146.1 equipment and those with both Rule 1146 series and other RECLAIM equipment.

Analysis of Rule 1146 and 1146.1 Units Currently Not Meeting NOx Limit

Out of the 250 RECLAIM facilities, 103 facilities were permitted with equipment that will be subject to PARs 1146, 1146.1 or 1146.2. As shown in Figure B(1), for the 103 facilities, there are 219 pieces of equipment that are subject to Rule 1146 and 40 pieces of equipment that are subject to Rule 1146.1. Of the 219 pieces of Rule 1146 equipment, 209 are currently not meeting the proposed BARCT limits. Of the 40 Rule 1146.1 equipment, 40 are currently not meeting the BARCT limit. Some facilities will have a combination of Rule 1146 and 1146.1 pieces of equipment at their facility.



**Includes units not subject to BARCT until burner replacement*

Figure B-1
RECLAIM Facilities with Rule 1146 Series Equipment

Figure B(2) shows the number of units that are currently not meeting the applicable NOx concentration limits in Rules 1146 and 1146.1 at a facility level. Equipment currently in compliance with RECLAIM BARCT of 12 ppm are considered in compliance until burner replacement. Most of the facilities had 1 to 3 pieces of equipment that are non-compliant with Rule 1146 & Rule 1146.1 limits. Nine facilities had between 4 and 7 non-compliant units, while 2 facilities had 8 or more pieces of non-compliant equipment. One of two facilities had 19 units between 5 and 20 MMBtu/hr not meeting the Rule 1146 BARCT limit of 7 ppm. However, 13 of the 19 units are currently meeting the RECLAIM BARCT limit of 12 ppm, and rule limits do not apply under burner replacement under the proposed rule amendments. The other facility had a total of 11 non-compliant units (3 Rule 1146 units and 7 Rule 1146.1 units), of which 3 are eligible to delay compliance until burner replacement. Excluding the units that could delay compliance until burner replacement, these two facilities are required to retrofit 6 and 8 units, respectively. These units range from 2 to 13 MMBtu/hr, and compliance can be achieved with ultra-low NOx burners.

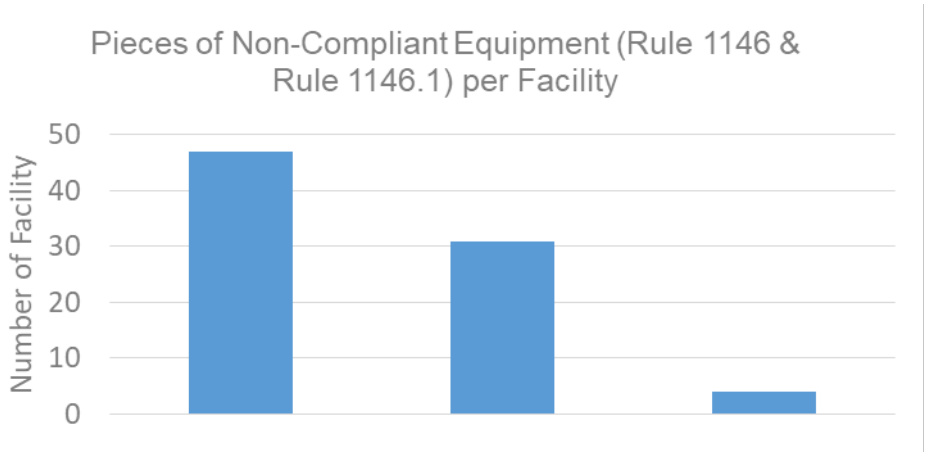


Figure B-2
Non-Compliant Equipment in Facilities Subject to Rules 1146 & 1146.1 Only

Analysis of Facilities with Rules 1146 and 1146.1 Equipment and Other Landing Rules

Staff has reviewed permits for all Rule 1146, 1146.1, and 1146.2 units in RECLAIM, and identified the number of non-Rule 1146 and 1146.1 units a facility has. As illustrated in Figure B(3), about half of the facilities had 3 or less non-Rule 1146 and 1146.1 units[9] ("other units"). Most of these equipment are subject to Rule 1110.2 (*Emissions from Gaseous - and Liquid-Fueled Engines*) or Rule 1147 (*NOx Reductions from Miscellaneous Sources*), which are scheduled to be amended in fall 2018 and in 2019 respectively. Twenty-five facilities had 4 to 10 other units. On this basis, facilities with 10 or less other units can meet the NOx concentration limits for Rule 1146 and/or Rule 1146.1 within three years.

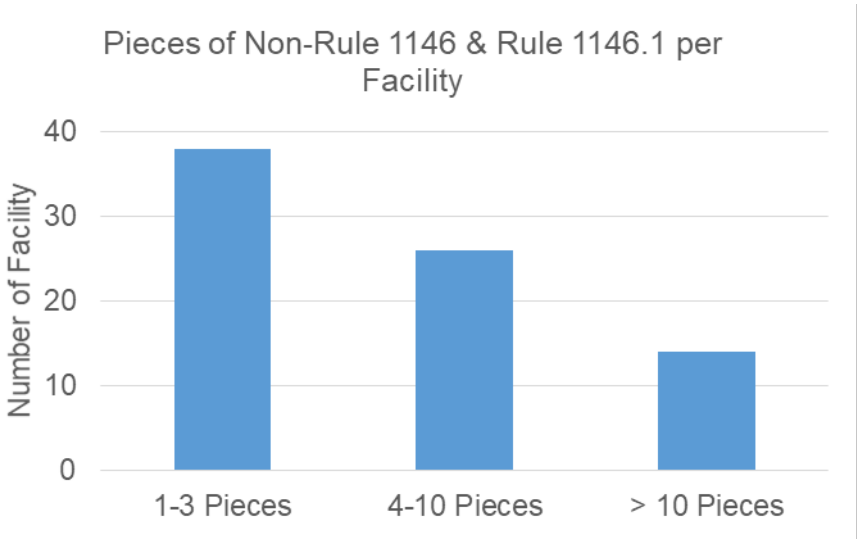
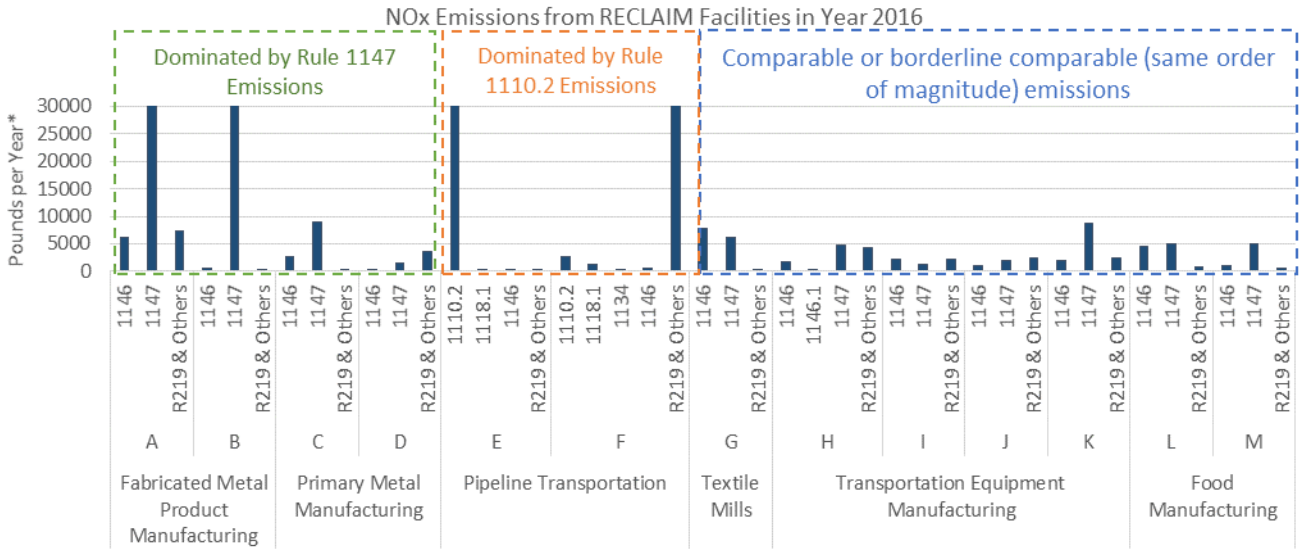


Figure B-3
Non-Rule 1146 and Rule 1146.1 Equipment

To ensure that the greatest emissions reductions are achieved as early as practicable, staff evaluated the NOx emissions for each source category for facilities with more than 10 other units. Figure B(4) illustrates the NOx emissions of the 13 facilities with more than 10 units subject to other landing rules. Four of the 13 facilities (Facilities A-D) had emissions dominated by Rule 1147 (*NOx Reductions from Miscellaneous Sources*) units. These facilities are associated with fabricated metal product manufacturing and primary metal manufacturing. Emissions from the two facilities (Facility E and Facility F) in the pipeline transportation industry were largely contributed by their internal combustion engines that are subject to Rule 1110.2 (*Emissions from Gaseous - and Liquid-Fueled Engines*). For the remaining facilities, emissions from their Rule 1146 series are mostly comparable with the emissions from other landing rules.

[9] Excludes Rule 1470 equipment



** Emissions from some facilities exceeded 30,000 pounds per year.*

Figure B-4
Emissions from Facilities with More than 10 Units
Subject to Other Landing Rules

For facilities with emissions dominated by other landing rules, staff evaluated each facility individually to better understand the emissions from different source types. The permitted units that are subject to the proposed rule amendments in Facility D and Facility E are already at BARCT, and they are not impacted by the compliance schedule in the proposed amendments. For Facilities A, B, C, and F, they have 5, 1, 2, and 3 permitted units that would be required to retrofit according to the compliance timeframe set forth in the proposed amendments.

These units ranged from 3 to 33 MMBtu/hr. For Rule 1146.1 and Rule 1146 Group III units not in compliance with RECLAIM BARCT of 12 ppm, will need to meet proposed limits of 7 ppm, compliance can be achieved with ultra-low NOx burners while units that meet RECLAIM BARCT do not need to meet proposed limit until burner replacement. Ultra-low NOx burners were utilized as a control technology to achieve the 9 ppm emission limit introduced from the 2008 amendments to Rule 1146/1146.1. Now, it is considered a readily available off-the-shelf technology, and installations of the ULNB are considered to be straightforward. Rule 1146 Group II units that are not in compliance with the RECLAIM BARCT will need to meet proposed limit of 5ppm while Group II units currently in compliance with RECLAIM BARCT will need to meet proposed limit of 7 ppm at burner replacement. Rule 1146 Group II units that do not meet RECLAIM BARCT would require the more expensive control technology of SCR. In particular, the units in Facilities A-C are subject to Rule 1147, which is scheduled to be amended in 2019 as presented in various monthly RECLAIM Working Group Meetings. Given the time required for facilities to perform the engineering evaluation as well as the time needed for permit application and processing, it is very likely that the implementation timeframe for the proposed amendments to Rule 1147 series would be later than January 1, 2021, leaving time for compliance with the Rule 1146 series equipment before that timeframe. Staff also determined that there are many other facilities belonging to different industries that are in a similar situation as some of these metal and aggregate facilities (e.g., many Rule 1147 pieces of equipment, along with Rule 1146 series equipment), and they would be subject to PARs 1146 series under the proposed amendments.

Analysis of Rule 1146.2 Units

Rule 1146.2 applies to boilers and process heaters with a rated heat input less than or equal to 2 MMBtu/hr. However, Rule 1146.2 units are exempt from SCAQMD permitting requirements per Rule 219 (Equipment Not Requiring a Written Permit Pursuant to Regulation II). Only a small portion of the Rule 1146.2 units are permitted due to unique circumstances, such as operators obtaining a lower emission factor for calculating the unit's potential to emit (PTE). As of September 2018, there is a total of 32 permitted Rule 1146.2 units in the RECLAIM universe, with 28 units meeting the existing Rule 1146.2 NOx concentration limit of 30 ppm. Among the 28 units, 21 of them were permitted at 12 ppm, above and beyond the 30 ppm requirement. Four of the 32 permitted Rule 1146.2 RECLAIM units were permitted at emission limits above the Rule 1146.2 limit, and would require retrofit / replacement to meet the existing Rule 1146.2 requirements. It is important to emphasize that majority of the Rule 1146.2 units in RECLAIM facilities are not permitted. Although non-RECLAIM facilities are required to register Rule 1146.2 equipment from 1 up to and including 2 MMBtu/hr under Rule 222 (*Filing Requirements For Specific Emission Sources Not Requiring a Written Permit Pursuant to Regulation II*), RECLAIM facilities are exempt from the registration requirements. In addition, RECLAIM facilities report emissions from Rule 1146.2 units in the aggregate with other Rule 219 exempt equipment. Thus, the actual number of Rule 1146.2 units in the RECLAIM universe and its associated emissions could not be accurately quantified as part of this rule development, and the analysis below is the best estimate based on the best available information to date.

To better estimate the number of Rule 1146.2 units in RECLAIM, staff evaluated the equipment inventory provided by the facility responses from the initial determination notifications. This initial notification included an existing list of NOx emitting equipment and a request for the owner or operator of the RECLAIM facility to confirm the RECLAIM source equipment at the facility, as well as to identify any NOx emitting equipment that is not subject to permitting requirements (e.g., Rule 1146.2 units). As of April 2018, 37 RECLAIM facilities responded to the initial determination notifications, and a total of 118 Rule 1146.2 Type 2 units were reported. Based on the results of this initial survey, on average, each RECLAIM facility has 3.19 pieces of Rule 1146.2 Type 2 equipment. Assuming the same ratio for the rest of the RECLAIM facilities, it is estimated that about 850 Rule 1146.2 Type 2 units are present in the RECLAIM universe comprising of 250 facilities. While this provides an adequate estimation of the number of Rule 1146.2 units under the RECLAIM program, staff commits to collect and improve the RECLAIM inventory for this source category through annual inspections.

Equipment by Size

One major goal of PR 1100 is to ensure that facilities affected by multiple landing rules will achieve the greatest emission reductions early, and that facilities will address higher emitting equipment first. The distribution of units affected by PARs 1146 and 1146.1 by size range is presented in Table B(1).

Table B-1
Number of Equipment by Size

Rule Applicability	Meet BARCT	Do Not Meet BARCT
Rule 1146		
Group I (≥ 75 MMBtu/hr)	2	5
Group II (20 to <75 MMBtu/hr	3	75
Group III (5 to < 20 MMBtu/hr)	5	129*
Rule 1146.1 (2 to <5 MMBtu/hr)	0	40#
Total	**10**	**249**

**30 of the 129 units can defer compliance until burner replacement under the proposed rule amendments*
 # 12 of the 31 units can defer compliance until burner replacement under the proposed rule amendments